RAILROAD GAZETTE

FRIDAY, SEPTEMBER 24, 1897.

CONTENTS

ILLUSTRATIONS:	PAGE.
Brooks' Twelve-Wheelers for the Buffalo, Rochester & Pittsburgh	662
The Accepted Plans for Electric Cars on the Brooklyn Bridge	664
New Shops of the Peoria & Eastern	666
Ballasted Floors for Short Spans	671
The Sargent Company's New Brake Shoe	671
Observations on Staybolt Breakages	674
Electric Traction on the Metropolitan Elevated, Chicago	674
CONTRIBUTIONS:	
Composition Brake Shoes.	661
The Theory of Brake Shoes	661
EDITORIALS:	
A Contribution to the Theory of Brake Shoes	672
Annual Reports—New York Central & Hudson River—New York, Ontario & Western—Atchison, Topeka & Santa Fe — Fitchburg — Autofagasta & Bolivia	673
EDITORIAL NOTES	672
GENERAL NEWS:	
Locomotive Building	678
Car Building	678

GENERAL NEWS.	PAGE.
Bridge Building	679
Meetings and Announcements	679
Railroad Law	680
Personals	680
Elections and Appointments	680
Railroad Construction	681
Electric Railroad Construction	681
General Railroad News	682
Electric Railroad News	682
Traffic	682
MISCELLANEOUS:	
Technical	677
The Scrap Heap	678
American Society of Railroad Superintendents	661
The Railway Signaling Club	663
The Paint Test by the Department of Public Works, New York	665
Meeting of the Traveling Engineers' Association	665
Convention of the New York Street Railway Association	668
Annual Convention of the Roadmasters' Association	670
Test of a Cahall Boiler	670
The Harbor of Montreal	676
Labor-Saving Devices at the Brooks Locomotive Works	677

Contributions.

Composition Brake Shoes.

CHICAGO, Sept. 1, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest the editorial in your issue of Aug. 27 on Composition Brake Shoes. There are a few points in regard to composition shoes which I can hardly reconcile with commonly accepted ideas.

The composition brake shoe produces a smooth wheel surface and a smooth surface on the face of the shoe. At the same time the composition shoe gives a higher co-efficient of friction than soft cast iron which has a rough surface. The common idea is that rough surfaces give greater friction than smooth ones. Also, the composition shoe has a higher co-efficient of friction than soft cast iron, but wears much longer in the same service. It has always been considered that increased friction was attended by more rapid wear.

It also suggests itself to me that on account of the higher co efficient of friction of composition brake shoes it would not be safe to put these shoes on cars where the brake rigging was designed and proportioned for using soft cast-iron brake shoes. There would seem to be danger from skidding the wheels when the composition shoes were so used.

I do not wish to convey the impression that I doubt the reliability of the results obtained with composition brake shoes, but the results on their face so conflict with accepted theories that I am led to believe there must be reasons for the differences which I have attempted to point out.

X.

The Theory of Brake Shoes.

The Westinghouse Air Brake Company,
NEW YORK, Sept. 18, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have read with interest your editorial comment on "The Theory of Brake Shoes," and presume that the conclusions are to a large extent justified. It appears to me that it was pretty conclusively shown in the laboratory tests of brake shoes that the element of heat has a very marked effect upon the co-efficient of friction. Where a test was made, under any given conditions, the shoe being cold at the beginning, and then immediately repeated without giving the shoe time to cool in the interim, the second test resulted in a co-efficient of friction considerably below that realized in the first test. This character of the results seemed to be independent of the pressure per square inch, or of the kind of brake shoe. It appears to have been pretty well established by microscopical examination that brake shoes frequently heat sufficiently to cause a flow of the metal, and, in any event, there appears to be a lubricating effect, either due to flowing of the metal or to rolling of particles between the shoe and the wheel, which varies with different pressures per square inch. To what extent this influence distinguishes the co efficient of friction of brake shoe materials of different qualities, we have as yet no means of determining.

In the table of "Average Results of Tests on Chilled Test Wheel" it appears to me that it is hardly satisfactory to draw conclusions by singling out from a number of tests those which gave the highest results. Such results would not be suitable guides in practice any more than should the co-efficient of adhesion between the wheel and rail, which occurs when the rail is in a very bad condition, be selected as a suitable one upon which to base braking power. Average conditions are far more satisfactory in practice, though the full available braking power under the best conditions is to some extent sacrificed and the danger of sliding wheels under unfavorable conditions of the rail is thereby increased.

Another feature, which I have never seen brought out in a discussion of this subject (except where I referred to it in the last paragraph but one of my preface to the reprint of the reports of the Westinghouse-Galton Brake Trials), is the desirability of such a material for brake shoes as shall give the highest ratio of the mean co-efficient of friction to its maximum value near the end of the stop. The brake-shoe pressure must be governed in large measure by the maximum value of the co efficient of friction; the mean value of the co-efficient of friction determines the work done in stopping the train. It would appear, from the figures given in your table, that the composition shoe has the advantage over the soft cast-iron shoe in this respect; but, as I have already suggested, it may be questioned whether conclusions drawn from single tests, selected from a group, have any special significance.

R. A. PARKE.

American Society of Railroad Superintendents.

Following are abstracts of certain committee reports presented at the meeting of the American Society of Railroad Superintendents in Nashville, Tenn., Sept. 22:

PRESERVATION OF SLEEPERS.

The Committee on Chemical Preservation of Cross Ties, a sub committee of the Roadway Committee, made a report stating that the members had been unable to meet, and therefore had made no extended investigation of the subject assigned, but the chairman reported some facts taken from the report of Mr. E. E. Russell Tratman, published in Bulletin No. 9 of the Government Division of Forestry. Among the data given are the proportions of different kinds of wood used for cross ties in the United States: Oak, 60 per cent.; pine, 20 per cent., etc.; the average life of railroad ties, as reported by 23 different railroad companies, and the average life of ties properly impregnated with creosote or chloride of zinc. This last is stated to be: For oak, 19.5 years: fir, 14 to 16 years; pine, 8 to 10 years; beech, 15 to 18 years.

The cost of preserving ties by different processes is given as follows, assuming the volume of each tie to be 3.5 cu. ft.:

Antiseptics.	Method of treatment.	Cost per tie, cents.
1. Dead oil	Modern method.	25.00
2. Bichloride of mercury	Steeping.	14.60
3. Chloride of zinc	Modern process.	8.25
4. Chloride of zinc and tannin	Modern process.	11.25
5. Sulphate of copper	Modern process.	8.80
6. Chloride of zinc	Direct Boucherie.	10.15
7. Sulphate of copper	Direct Boucherie.	10 46
8. Chloride of zinc	Boucherie.	10.71
9. Sulphate of copper	Boucherie.	11 22

If, says the report, there are 80,000,000 ties used annually now, and if, by the use of preservatives, the life of ties is doubled, a saving of 40,000,000 ties would be effected annually; and, if it costs an average of seven cents per tie to put them in the track, a saving of $2,800,000 annually would be made by the railroads of this country in the item of labor alone, were the practice of using preservatives generally adopted.

REPORT ON DISCIPLINE.

Messrs. A. H. Smith (L. S. & M. S.) and W. L. Blair (N. Y. C. & St. L.), a sub-committee of the Committee on Transportation, made a report on discipline, the substance of which follows:

Discipline implies a disciple, a learner; and by implication there must be a teacher or a leader. A leader—a railroad officer, for example—has a grave responsibility in the example which he is bound to set before the employee. On railroads the general idea of discipline has been that it is primarily punitive, and unfortunately this idea seems to still prevail widely, whereas discipline should be primarily educational. History proves that in all large undertakings with men a necessary element of success is a feeling of confidence on the part of the rank and file in the fairness of the leader.

The report then goes on to compare the general custom of reprimand, suspensions, etc., with the Fall Brook method (discipline without suspension), which the committee says has now been adopted by lines aggregating 28 per cent. of the railroads of the United States. Continuing, the report says:

Your committee, after a careful review of the opinions and experiences of the officers and employees of railways that have practiced some method of administering discipline without suspension, feel that the ends of discipline will be best subserved by such method. The principal points of superiority of this method over the original method appear to be: Steady employment for regular men, consequently a greater percentage of experienced men; less number of names on the payroll; no large extra list; less hardship to the families of employees, resulting in a greater feeling of contentment. It should make better citizens of employees; tend to keep them out of debt; create homes, and thereby domesticate the men; and promote good service. In its application, the same care should be exercised in investigation and conclusions as in the original method, to prevent entering against an employee in his record that which he does not justly merit.

On some railways which have adopted some form of the "Fall Brook" system, they have put in effect a plan of redemption, so to speak. It is a discouraging thought to a well-meaning employee, that in case he has in his record several entries of errors and mistakes, no matter how good his subsequent conduct may be, those entries will stand against him. Any one of us would naturally desire some arrangement whereby, if, after six months or a year, or some definite time, we had prevented unfavorable entries against our record, our old scores would then be wiped out, and to know that we had redeemed the errors of the past. We, therefore, recommend that in application of either of the methods of discipline referred to, this idea be embodied in the plan. We believe that it will stimulate better service and increase respect on the part of the employee toward the officer, and draw the two nearer together.

From observation covering a period of 20 years, your committee is of the opinion that, generally speaking, railway discipline is being applied to-day in a manner more reasonable, more humane and more just than it has ever been. . . . It is not an uncommon thing, nowadays, to read of meetings in different parts of the country where railway officers and employees have met to discuss questions outside of those of grievances, for their mutual benefit. These meetings have been for the discussion of technical questions connected with mechanics, transportation, matters of comfort for employees and kindred subjects. We are of the opinion that such meetings should be encouraged. We urge upon both officers and employees the desirability of practicing what is taught by the adage, "Put yourself in his place."

REPORT ON ECONOMICAL TRAINLOAD.

Messrs. C. R. Fitch (Erie) and James Donnelly (L. V.), a sub-committee of the Committee on Transportation, reported on this subject, advocating the loading of freight trains on a tonnage basis and setting forth the wastefulness of less accurate methods. To make the best use of motive power it is necessary not only to know the weight of all cars and their loads, but to see that cars are always loaded as nearly as possible to their full capacity. It will often be found that five cars have been used to carry a quantity of coal which could just as well have been put into four cars. With merchandise, cars cannot always be fully loaded, but an improvement can be made by establishing transfer stations and having one central office supervise the loading of freight at all stations. This office should receive daily reports from agents showing the quantity of freight loaded in each car, and these reports should be carefully studied. Agents at principal points should report cars of bulk freight that are not fully loaded. Station agents should take care not to give shippers larger cars than they require.

Where freight trains must make fast time, or where they must frequently be set off to clear the track for passenger trains, they cannot always be loaded to the full capacity of the engine, but such unfavorable conditions on a part of the road should not prevent the fullest possible loading of engines on other parts.

It would be difficult to enumerate all the items of expense which should show a reduction by reason of the adoption of the tonnage rating in connection with increasing the average tonnage per car, but we may mention the following: There will certainly be a decrease in the cost per ton of hauling freight. Under the tonnage rating there is a reduction of train miles, thus requiring fewer engines and less investment of capital. There is more equable movement of trains, avoidance of overloading engines, which saves delay to other traffic on the road as well as expense of doubling over grades. There should be less danger of damage to cars and freight in transit. The adoption of systematic methods in train rating should prove beneficial in other directions in that it is a means of education to employees.

ECONOMY IN FUEL AND COAL.

Mr. C. E. Doyle (C. & O.), Chairman of a sub-committee of the Committee on Transportation, presented a report setting forth the necessity of constant efforts to raise the efficiency of enginemen and firemen. However perfect the engine, variations in the skill of the men who run it may easily make a difference of 25 per cent. in the amount of fuel used, from which it appears that there may be a possible saving in the cost of fuel for locomotives of $17,000,000 a year, the total locomotive fuel bill of the United States for a year being $70,000,000. To encourage enginemen to do their best the Chesapeake & Ohio prints a monthly performance sheet in which the work of each one of the enginemen on a division is set forth. It shows the number of trips, the mileage, the tonnage and the coal and oil consumed, and the engineman who has hauled the largest number of tons of freight to the ton of coal is placed at the head of the list. A sample of one of these sheets accompanies the report, showing the work of 27 runners in the Allegheny District for the month of June, 1897. A portion of this table, showing the first five performance columns, is given below.

This report is sent to each engineman and fireman every month, and it stimulates the men with inferior records to greater care and to greater efforts at learning the best methods of doing their work. It will be observed that the best record was made by a man who ran only one trip in the month covered by the report, manifestly an inadequate basis for comparison. Aside from this one item, the amounts of coal used by each man (those who made about the average monthly mileage, say 2,000 miles) varied from 140 to 170 tons. Calling W. R. Calhoun's record the best in this report, the poorest, omitting several records of men who ran but a few trips, was one of 9,994 tons of freight hauled one mile with one ton of coal, or about 45 per cent. poorer than Calhoun's record. The 15 men next following Calhoun each hauled over 15,000 tons of freight one mile per ton of coal. The oil records do not keep even pace with the coal records, some men who were economical in their use of oil standing a considerable distance from the head in the coal record.

RELATION OF THE GAGE OF WHEELS TO THE GAGE OF TRACK.

A paper on this subject was read by Mr. A. P. Gest, Superintendent of the Belvidere Division of the Pennsyl-

Nashville, Chattanooga & St. Louis.—The earnings for August and for the two months ended Aug. 31 were as follows:

August:	1897.	1896.	Inc. or Dec.
Gross earn	$490,718	$401,020	I. $89,698
Oper. expen	310,508	253,652	I. 56,856
Net earn	$180,210	$147,368	I. $32,842
Charges	126,301	124,981	I. 1,320
Surplus	$53,909	$22,387	I. 31,522
Two months:			
Gr ss earn	$970,996	$819,688	I. $151,308
Oper. expen	610,127	510,380	I. 99,747
Net earn	$360,869	$309,308	I. $51,561
Charges	252,603	249,962	I. 2,641
Surplus	$108,266	$59,346	I. $48 920

New York, New Haven & Hartford.—The earnings for the quarter ended June 30 were reported as follows:

Three Months.	1897.	1896.	Inc. or Dec.
Gross earn	$7,912,547	$7,608,985	I. $303,562
Oper. expen	5,447,876	5,604,876	D. 157,000
Net earn	$2,464,671	$2,004,109	I. $460,562
Other income	184,397	497,129	D. 312,732
Total	$2,649,068	$2,501,238	I. $147,830
Fixed charges	1,562,633	1,499,777	I. 62,856
Balance	$1,086,435	$1,001,461	I. 84,974

New York, Susquehanna & Western.—The earnings for the year ended June 30, according to the annual report just received, were as follows:

Year:	1897.	1896.	Inc. or Dec.
Gross earn	$2,248,823	$2,123,729	I. $125,094
Oper. expen	1,278,345	1,174,992	I. 103,353
Net earn	$970,478	$948,737	I. $21,741

The percentage of operating expenses to gross earnings was 56.85 per cent. in 1897, against 57.22 per cent. in 1896.

Norfolk & Western.—The earnings for July were as follows:

	1897.	1896.	Inc. or Dec.
Gross earn	$892,409	$882,724	I. $9,685
Oper. expen	626,599	670,750	D. 44,151
Net earn	$265,810	$211,974	I. $53,836

Philadelphia & Reading.—In accordance with the provisions of the mortgage loan of Jan. 30, 1883, of the Little Schuylkill Navigation & Coal Co., controlled by the Philadelphia & Reading, notice is given that 20 bonds for $1,000 each have been drawn for redemption numbered as follows: 2, 26 63, 71, 81, 93, 117, 144, 177, 195, 208, 258, 271, 272, 273, 314, 325, 359, 379, 389. Interest will cease on these bonds Oct. 1.

St. Louis, Peoria & Northern.—The complaint of Dwight L. Wing, that this company was proceeding illegally in building its Peoria extension, came before the State Railroad Commissioners on Sept. 7, but was promptly dismissed.

Southern.—The Richmond & Danville, which is a part of this system, has advertised to purchase at a price not to exceed par and accrued interest $46,814 of its equipment five per cent. mortgage gold bonds dated Sept. 3, 1889. This is in accordance with the provision of these bonds, of which $979,000 is outstanding.

Staten Island Rapid Transit.—The earnings for the year ended June 30 were reported as follows:

Year.	1897.	1896.	Inc. or Dec.
Gross earn	$648,316	$764,455	D. $116,139
Oper. expen	392,325	416,543	D. 24,218
Net earn	$255,991	$347,912	D. $91,921
Charges	328,448	321,467	I. 6,981
Surplus (def)	$72,457	$26,445	D. $98,902

Terre Haute & Indianapolis.—A petition has been filed in the Federal Court at Indianapolis, Ind., in the case of Benjamin Harrison, trustee, for an appeal to the U. S. Circuit Court against the order of Judge Woods that the Logansport Branch of this road be sold to satisfy mortgages.

Toledo, Peoria & Western.—The annual report for the year ended June 30 gives the earnings as follows:

Year:	1897.	1896.	Inc. or Dec.
Gross earn	$888,881	$1,010,270	D. $121,389
Oper. expen	704,406	789 482	D. 85,076
Net earn	$184,475	$220,788	D. $36,313

The interest charge for the year 1897 was $221,674. There was also a claim against the Purchasing Committee of $7,174, which left a deficit for the year of $44,372.

Union Pacific.—The earnings of the entire system and of the Union Pacific proper for July and for the seven months ended July 31 were reported as follows:

ENTIRE SYSTEM.

July:	1897.	1896.	Inc. or Dec.
Gross earn	$1,642,413	$1,427.515	I. $214,898
Oper. expen	1,142,726	914,926	I. 227,800
Net earn	$499,687	$512,589	D. $12,902
Seven months:			
Gross earn	$9,643,905	$8,558,101	I. $1,085,804
Oper. expen	6,535,991	5,818,979	I. 717,012
Net earn	$3,107,914	$2,739,122	I. $368,792

UNION PACIFIC PROPER.

July:			
Gross earn	$1,397 264	$1,248.274	I. $148,990
Oper. expen	970,951	756,146	I. 214,805
Net earn	$426,313	$492,128	D. $65,815
Seven months:			
Gross earn	$8,120,519	$7,409,344	I. $711,175
Oper. expen	5,431,041	4,847,931	I. 583,110
Net earn	$2,689,478	$2,561,413	I. $128,065

Holders of the 6 per cent. gold collateral trust notes of this company are notified that J. P. Morgan & Co., depositaries, are prepared to make payment on Sept. 28, 1897, of 30 per cent. on the principal of these certificates upon presentation at their office.

Vermont Central.—A meeting of the holders of the American Loan & Trust Company's certificates, a deposit for the first mortgage five per cent. bonds ($7,000,000 outstanding) of the Consolidated Railroad Co. of Vermont, a part of the Vermont Central, will be held at the Real Estate Exchange, Boston, Oct. 5, at 3 p. m., to consider the following term of reorganization: That a new corporation be formed, in which is to be vested the title to all property of the Consolidated of Vermont, and the title to the use without payment of rent of all the branches of said railroad and the leasehold estate in the New London Northern, which new corporation will make a new mortgage to secure an issue of $10,000,000 four per cent. gold bonds, payable in 21 years from Feb. 1, 1898. Also a second mortgage to secure two issues of adjustment 21-year bonds, payable in gold at four per cent. out of the net income of the company, of which $1,050,000, shall be known as series A, and $3,000,000, as series B. The holders of the first mortgage 5 per cent. bonds are to receive 85 per cent. in new first mortgage bonds, 15 per cent. in second mortgage series A bonds, and accrued interest in series B bonds. It is reported that the Grand Trunk will make a traffic contract with the new corporation and agree that if the net income of the new company is not sufficient to pay the interest on the first mortgage bonds and the series A bonds, it will make good the deficiency, provided it is not required to pay more than 30 per cent. of the gross receipts from traffic interchanged with the new company.

Wheeling & Lake Erie.—The Stockholders' Committee of this company, composed of Dick Bros. & Co. Bell & Co., Clark, Ward & Co., Webb & Prall, and Thompson & Mairs, has issued a call for a deposit of stock with the Central Trust Company, not later than Sept. 28. Negotiable certificates will be issued for the same under a preliminary agreement.

Electric Railroad News.

Baltimore, Md.—The newly organized Board of Directors of the Baltimore, Middle River & Sparrow's Point Railroad Co. have elected Daniel Cooke President, and Carroll T. Bond, Vice-President. James Young, formerly of the Board of Directors, and the first President of the road, has retired, and has been succeeded by Alexander Brown, of the well-known banking firm. It is stated that Mr. Brown owns one-fourth of the entire $400,000 capital stock.

Robert Poole has filed a petition asking for an injunction to restrain the Fall Road Electric Co. from building its track on Union avenue. Mr. Poole claims that the road over which the company proposes to build its line is private property.

Carlisle, Pa.—Council has requested the Cumberland Valley Traction Co. to remove its tracks from the streets of the town within 60 days for failing to live up to the terms of the ordinance.

Chicago.—A trial trip was made on he Union Loop last week and soon it will be made ready for regular passenger service. In 1894 the Union Elevated Railroad Co. was organized, with a capital of $5,000,000, and work was begun in May of last year. It is understood that the loop, including frontage consents, cost $3,750,000. The remainder of the money is held in trust by the Central Trust Co., of New York. For detailed information, with drawings, see issues of May 8 and 15, 1896; also see a short article on another page of this issue.

Doylestown, Pa.—The agreement conveying all the franchises of the Doylestown & Willow Grove Turnpike Co. to the Bucks County Railway Co. has been signed. The electric railroad company must keep the turnpike in good condition and the rails must be laid within one year. The turnpike company receives an annual dividend of five per cent. on the capital stock. It is stated that the contracts for the electric road have already been awarded.

Indianapolis, Ind.—A receiver has been asked for by M. Malone & Co. for the Indianapolis, Anderson & Marion Railway Co.

New York.—A public hearing was held on Thursday of last week by the property owners residing on or near Amsterdam avenue to protest against the proposed building of four lines of track on Amsterdam avenue and remodeling the line so as to use the electric conduit method of transmission. Twelve feet on either side of the car tracks is now left for public use and this will be practically all occupied by the tracks if the new lines are built.

Lawyer Wm. H. Page, on behalf of the Forty-second Street, Manhattanville & St. Nicholas Avenue Railway Co., has served notice that the railroad company has instituted mandamus proceedings to compel the Department of Public Works to issue a permit for tearing up the tracks and changing the motive power to electricity on Amsterdam avenue.

Norridgwock, Me.—A syndicate has purchased the Skowhegan & Norridgwock Electric Railroad for $15,000 and will make improvements on the line this fall.

Philadelphia.—Mr. A. J. Cassatt has been elected a member of the Board of Directors of the Union Traction Co., to fill the vacancy caused by the resignation of C. F. Fox. A short sketch of his career will be found among the personal items.

Westbrook, Me.—The city of Westbrook has voted to purchase 200 shares at par value of the capital stock of the Westbrook, Windham & Harrington Electric Railway Co., which proposes to build a road 30 miles in length.

TRAFFIC.

Traffic Notes.

The Canadian Government has stationed a customs officer at Boston, to inspect baggage going to Canada.

The United States Grand Jury sitting at Minneapolis, last week, found no indictment for violations of the Interstate Commerce Law.

The suit to test the New York anti-scalping law fell through, the man arrested having bought his ticket before the law went into effect.

The Managers of the Joint Traffic Association have approved the organization of the mileage ticket bureau of the Central Passenger Association.

The Western Elevator Association, in which are about 40 of the grain elevators at Buffalo, has decided to dissolve, there being so many elevators outside the Association that rates could not be satisfactorily maintained.

The Southeastern Wholesale Grocers' Association has issued a circular announcing that the railroads have made important advances in the rates on groceries in less than carload lots, thus complying with the demand for more favorable rates on carloads which the Association has been pressing for some time.

The hearing on the question of a permanent injunction, to restrain the enforcement of the reduced rates ordered by the South Dakota Railroad Commissioners, has been postponed for a month. In the meantime the Grangers, who are impatient for a reduction, claim that the Governor of the state may possibly call an extra session of the Legislature so as to reduce rates absolutely and without delay.

The Lone Star Line, the new Texas steamship line which has for several weeks kept Texas freight rates at a very low basis, has advanced its northbound rates from Galveston to New York to the basis of 40 cents per 100 lbs. first class. The southbound rates remain unchanged at the 10-cent basis. The Mallory & Southern Pacific steamers continue to carry freight at 2 cents per 100 lbs., though they charge higher for some undesirable classes of freight.

The fare from New York to Dawson City, B. C., is $680. This is the lowest first-class rate named by the Columbia Navigation & Trading Co., of 69 Wall street, New York City, of which Raymond & Whitcomb are the agents. The rate named is for passage by steamer around Cape Horn, leaving New York Dec. 1. It includes board and the transportation of 1,000 lbs. of baggage. There will be numerous stopovers, some of them apparently lasting many days.

The merchants of New York continue their efforts to get buyers to come to the city from long distances, and from the Southern States some of the lines have extended the time for the sale of reduced rate tickets. The Joint Traffic Association has been asked to grant additional "excursions" in October and November. The merchants of Philadelphia appear to be as satisfied and enthusiastic as those of New York, large numbers of buyers having visited that city. The Southern roads leading to Cincinnati and Louisville have made reduced rates to those cities for the month of September.

Suspension of Fourth Section.

In order that the Chicago & Eastern Illinois may meet the competition of shorter lines between Chicago and Indiana points the Interstate Commerce Commission has suspended the operation of the long and short haul clause of the law as affecting those points. In its application for relief the road showed that its line is crossed at Fair Oaks by the C., I. & L., at Wheatfield by the same and the Indiana, Illinois & Iowa, at Wilders by the Erie and at La Crosse by the C. C. C. & St. Louis, all of which are shorter to Chicago by from 40 to 60 miles. It cannot compete with these roads below these junction points without so reducing its rates to points north thereof as to do business at a loss. The Commission has, therefore, ordered that it may charge less for transportation of freight between Chicago and Wilders, La Crosse, Wheatfield and Fair Oaks via its line through Momence, Ill., and Perry Junction, Ind., than for the shorter distance over the same line in the same direction between Chicago and Pogue, Morocco, Brook and Perry Junction, Ind., provided that its rates are not less than its competitors' charges, and that it does not increase the rates to the nearer points.

Chicago Traffic Matters.

CHICAGO, Sept. 15, 1897.

The movement of the grain from the West continues heavy, the receipts at Chicago last week having been over 11 million bushels.

The rates for grain by lake fell off a little last week, but they have again risen to 2 cents on corn to Buffalo.

There is a considerable scarcity of cars on all the eastbound grain-carrying roads.

The Grand Trunk road has stirred up its competitors by advising the Chicago-St. Paul lines, through Messrs. Midgely and Caldwell, that it will hereafter make through rates with them on both freight and passenger business, to meet Soo competition. By this action the Grand Trunk seems to ignore the Joint Traffic Association, and further developments are looked for.

The 40 odd roads in the Central Passenger Association mileage bureau, aroused by the general criticism of the new interchangeable mileage ticket, have passed resolutions reaffirming their confidence in the advantages of the ticket. They promise that should modifications be found desirable the Association will promptly make them. President Ingalls of the Big Four is quoted as saying that he will grant the concessions in running time demanded by the Monon when the fall schedules are arranged in October. It is thought that the Monon will become a member of the bureau at that time. Meantime some roads are accepting non association books of other roads' issue to a limited extent.

The roads west of Chicago are as far apart as ever on the question of interchangeable mileage tickets. They are now considering the Thrall and the Sebastian tickets. There are so many divergent views that there is no immediate prospect of any interchangeable ticket being adopted. In the meantime the Wisconsin Central, not in the Association, has given notice that, beginning Oct. 1, it will place on sale a 1,000-mile ticket for $25 with a $5 rebate.

Eastern lines have decided to run cheap excursions into Chicago from Pittsburgh, Cleveland and Columbus during the early part of October. This is a radical departure, tickets for the trip being made good for five days and the different roads taking turns in running the excursions. It is said that the fares will be $6 for the round trip from Cleveland and Columbus, and $10 from Pittsburgh.

Hard coal rates from Chicago to Missouri River points were on Sept. 11 reduced to $2 a ton; thinking that another cut may be made similar to that of last fall, coal shippers are holding off.

The Interstate Commerce Commission will convene in this city on Sept. 23 to take up various complaints against the railroads.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending Sept. 9 amounted to 63,221 tons, as compared with 76,560 tons the preceding week. This statement includes 31,471 tons of grain, 2,850 tons of flour and 10,242 tons of provisions, but not livestock. The following is the statement in detail for the two weeks:

Roads.	WEEK ENDING SEPT. 9.		WEEK ENDING SEPT. 2.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	3,897	6.2	2,379	3 1
C., C., C. & St. Louis	2,480	3.9	4,711	6.1
Erie	10,539	16.7	9,131	11.9
Grand Trunk	7,090	11.2	9,084	11.9
L. S. & M. S.	3,287	5.2	6,790	8.9
Michigan Central	13,696	21.7	18,222	23.8
N. Y., Chi. & St. L.	4,076	6.4	2,738	3.6
Pitts., Cin., Chi. & St. Louis	4,044	6.4	5,466	7.1
Pitts., Ft. Wayne & Chicago	8,625	13.6	10,790	14.1
Wabash	5,487	8.7	7,249	9.5
Totals	63,221	100.0	76,560	100.0

Lake shipments last week were 193,050 tons.

The firebox is of Carnegie steel 9 ft. 5 in. long, 3 ft. 1⅞ in. wide, 77 in. deep at the front end and 74 in. deep at the back. A brick arch supported on water tubes is used. The heating surface of the firebox is 225 sq. ft., that of the tubes 2,106 sq. ft., making the total heating surface 2,331 sq. ft. The grate area is 30.4 sq. ft.

The tender loaded weighs 90,000 lbs. and has a water capacity of 4,500 gallons and a coal capacity of eight tons. The driving-wheel centers, pistons and crossheads are of cast iron, steel castings being used only for a few small parts.

The driving-wheel tires were furnished by the Midvale Steel Co., while the tires for the tender and truck wheels are Krupp. The axles are hammered iron, made by the Brooks Locomotive Works. The driver and tender brake equipment, together with the air pumps and governors, was furnished by the New York Air Brake Co. The Nathan Mfg. Co. furnished the injectors, No. 10 Monitor and the lubricators, the Trojan Car Coupler Co. the front and back couplers, the Chas. Scott Spring Co. the driving and tender springs, the Jerome Metallic Packing Co. the piston and valve rod packing, the H. W. Johns Mfg. Co. the boiler covering, and H. L. Leach the sanding device. Kunkle 3½-in. safety valves and Ashcroft steam gages are used. The following are the general dimensions:

Fuel	Bituminous coal
Weight on drivers	140,500 lbs.
" " truck wheels	31,500 lbs.
" total	172,000 lbs.
" tender loaded	90,000 lbs.
Wheel base, total, of engine	25 ft. 5 in.
" " driving	15 ft. 6 in.
" " total (engine and tender)	52 ft. 9 in.
Length over all, engine	37 ft. 10¼ in.
" " total, engine and tender	62 ft. 1¼ in.
Height, center of boiler above rails	8 ft. 9⅛ in.
" of stack, " "	14 ft. 5 in.
Main crank pin, size	5 × 7¼ in. dia. 6½ × 6¼ in.

Cylinders.

Cylinders, diameter	21 in.
Piston, stroke	26 in.
" rod, diameter	4 in.
Kind of piston-rod packing	Metallic
Main rod, length center to center	8 ft. 7 in.
Steam ports, length	18½ in.
" " width	1⅝ in.
Exhaust ports, length	18⅛ in.
" " width	3 in.
Bridge, width	1¼ in

Valves.

Valves	Richardson balanced slide
Valves, greatest travel	6 in.
" outside lap	⅞ in.
" inside lap, or clearance	3/32 in.
" lead in full gear	1/16 in.

Boiler.

Boiler, type of	Player improved Belpaire
" steam pressure	180 lbs.
" material in barrel	Carnegie steel
" thickness of barrel	5/16 in.
" diameter " "	68 in.
Seams, horizontal	Quintuple riveted
" circumferential	Double riveted
Thickness of tube sheets	¾ in. front, 5/16 in. back
" crown sheet	5/16 in.
Crown sheet stayed with	1 in. direct stays
Dome, diameter	30 in.

Firebox.

Firebox, length	9 ft. 5 in.
" width	3 ft. 1⅞ in.
" depth, front	77 in.
" depth, back	74 in.
" material	Carnegie steel
" thickness of sheets	Sides, 5/16 in.; back, 5/16 in.
" with brick arch on water tubes.	
" water space, width	Front, 4 in.; sides, 3½ in.; back, 4 in.
Grate	Cast-iron rocking.

Tubes.

Tubes, number	324
" material	Lap welded charcoal iron
Tubes, outside diameter	2 in.
" length over sheets	12 ft. 7 5/16 in.

Smokebox.

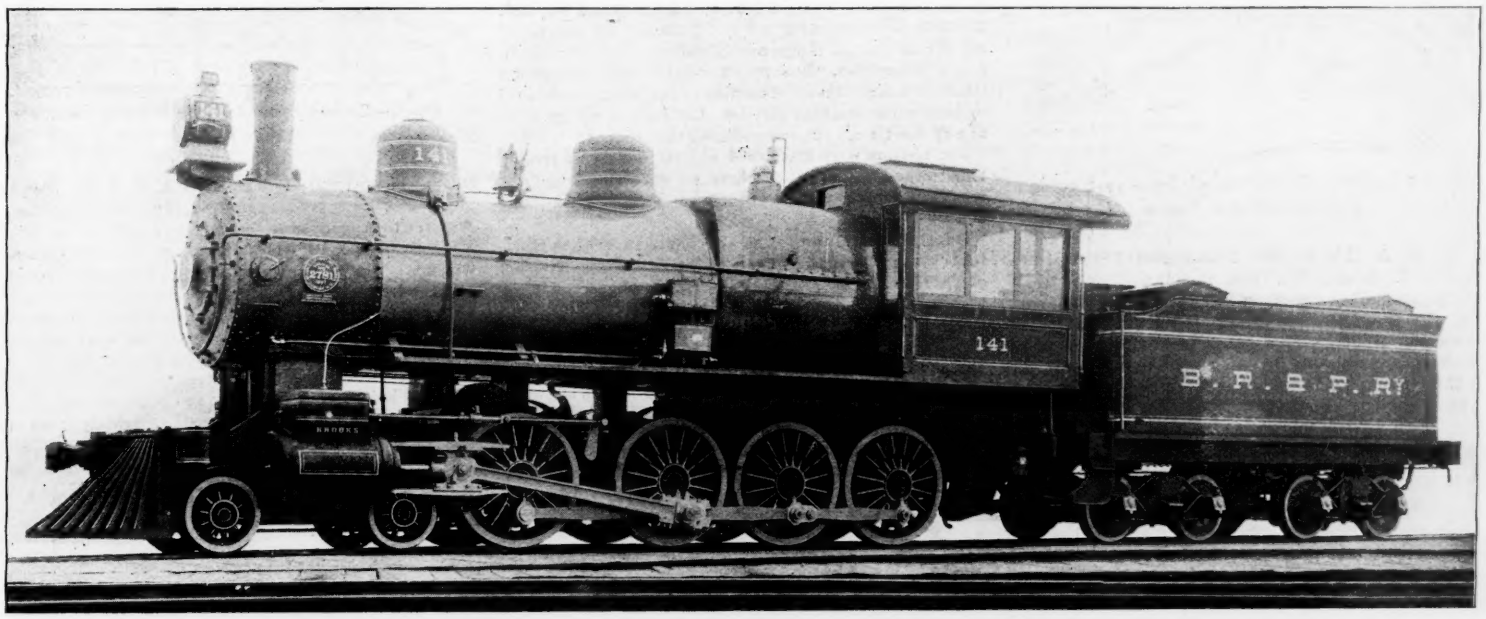
Smokebox, diameter	71 in.
" length	61 in.

Other Parts.

Exhaust nozzle, double	Permanent
" " diameter	3¾ in.
" " distance of tip below center of boiler	4½ in.
Netting	Wire
Netting, size of mesh or perforation	2½×2½ in.
Stack	Taper
" least diameter	14 in.
" greatest diameter	17 in.
" height above smokebox	2 ft. 8 in.

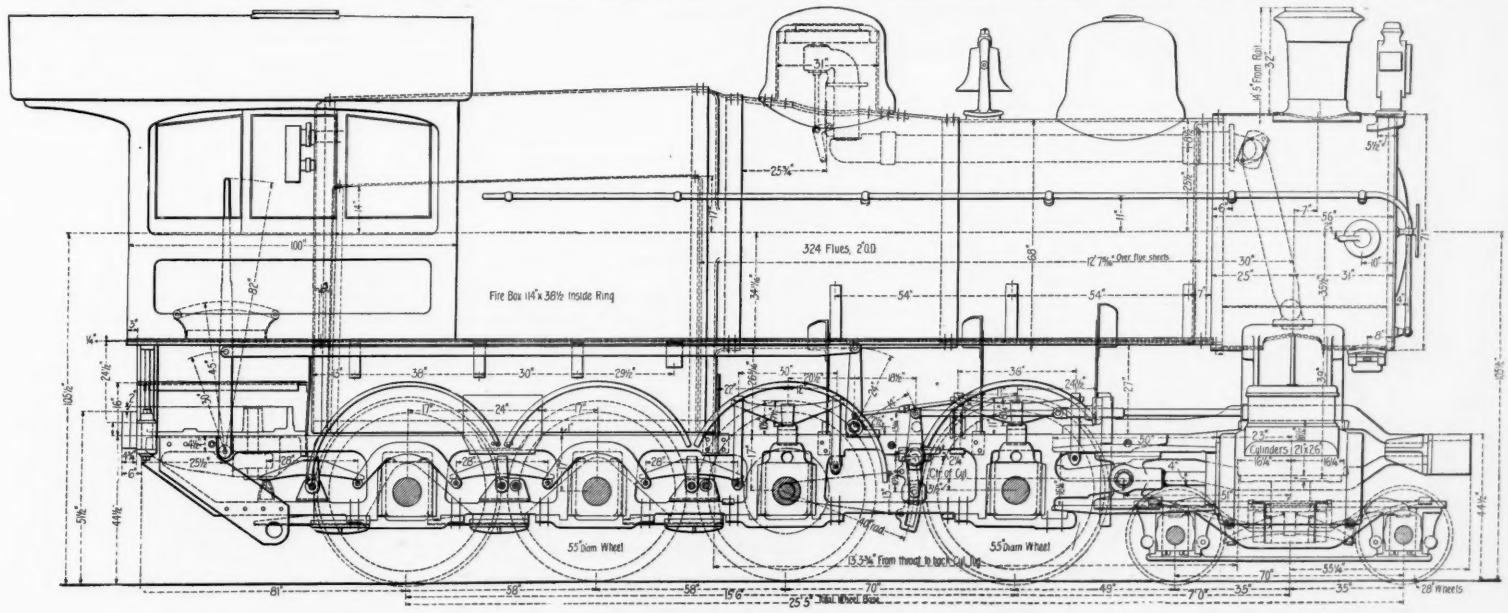
Tender.

Type	Swivel trucks
Tank capacity for water	4,500 gal.
Coal capacity	8 tons
Kind of material in tank	Steel
Thickness of tank sheets	5/16 × ¼ in.
Type of under frame	10-in. steel channels
Type of truck	Diamond
Truck with	Rigid bolster
Type of truck spring	Double elliptic
Diameter of truck wheels	33 in.
Diameter and length of axle journals	4¼ × 8 in.
Distance between centers of journals	6 ft. 3 in.
Diameter of wheel fit on axle	5⅝ in.
Diameter of center of axle	4¾ in.
Type of truck bolster	I beam
Length of tender from over bumpers	24 ft. 3 in.
Length of tank	19 ft. 6 in.
Width of tank	8 ft. 8 in.
Height of tank, not including collar	4 ft. 7 in.
Height of tank over collar	5 ft. 7 in.
Type of back drawhead	Trojan M. C. B. coupler



Twelve-Wheel Locomotive—Buffalo, Rochester & Pittsburgh.

Mr. C. E. TURNER, *Superintendent Motive Power.* *Built by the* BROOKS LOCOMOTIVE WORKS, *Dunkirk, N. Y.*



Brooks 12-Wheeler for the Buffalo, Rochester & Pittsburgh.

Heating surface, firebox	225 sq. ft.
" " tubes	2,106 sq. ft.
" " total	2,331 sq. ft.
Grate area	30.4 sq. ft.

Wheels and Journals.

Drivers, number	8
" diameter	55 in.
" material of centers	Cast iron
Truck wheels, diameter	28 in.
Journals, driving axle, size	8½×10 in.
" truck " "	5½×10½ in.

The Railway Signaling Club.

The principal doings of the Railway Signaling Club at its meeting of Sept. 14 and 15 were reported in the last issue of the *Railroad Gazette.*

On Wednesday evening five additional new members were elected. The thanks of the Club were tendered to the Lehigh Valley and the New York, New Haven & Hartford railroads, and to the National Switch and Signal Co., for courtesies to the Club.

The discussion on Derailing Switches was resumed, but it resulted only in deciding what subjects should be referred to committees. Mr. Sperry's paper, which furnished the topics that were under discussion, contained about 20 different subjects A special committee consisting of Charles Hansel, W. H. Elliott and Henry Johnson was finally instructed to gather all available information as to the value of derails and report to the Club at a future time.

It was then resolved to refer most of the other subjects to a committee to be appointed by the

vania Railroad. Mr. Gest pointed out the inaccuracies of the rules of the Master Car Builders' Association for mounting wheels on their axles, and for inspecting the wheels of cars transferred from one road to another,

CHESAPEAKE & OHIO RAILROAD, ALLEGHENY DISTRICT—ENGINEMEN'S PERFORMANCE, JUNE, 1897.

	Omohundro, J. R.	Calhoun, W. R.	Jordan, C. F.	Devine, C. I.	Boes, J. S.	Butcher, C. H.	Engart, E. B.	Hyde, T. J.	Dudley, W. G.
Trips	1	18	11	20	20	16	14	10	22
Average miles per trip	112	112	112	112	112	112	112	112	112
Mileage	112	2,016	1,232	2,240	2,240	1,792	1,568	1,120	2,464
Tons hauled	2,018	24,238	14,510	26,236	25,635	21,102	19,105	118,49	28,017
" " per trip, average	2,018	1,346	1,319	1,312	1,282	1,319	1,364	1,185	1,473
" " one mile	226,016	2,714,656	1,625,120	2,938,432	2,871,120	2,363,424	2,139,760	1,327,088	3,137,904
Coal, tons consumed	9	150	92	170	170	141	128	80	191
" miles run per ton	12 4	13.4	13.3	13.2	13.2	12.7	12.2	14.0	12.9
Coal, tons freight hauled one mile per ton	25,113	18,098	17,664	17,285	16,889	16,762	16,717	16,589	16,428
Coal cost 1,000 tons freight hauled 100 miles $	2.59	3 59	3.62	3.76	3.85	3.89	3.89	3.92	3.96
Oil, pints consumed, valve	2	33	17	30	30	26	21	14	39
" " " engine	4	75	55	86	92	72	66	40	98
" miles run to pint, valve	56 0	61 1	72.4	74.7	74.7	69.0	74.7	80.0	63.2
" " " " engine	28.0	26 9	22.4	26 0	24 3	24.9	23.8	28 0	25 1
" tons hauled one mile to pint, valve	112,958	82,262	95,595	97,947	95,704	90,901	101,893	94,792	80,459
" " " " " engine	56,479	36,195	25,002	34,168	31,208	32,825	32,420	33,177	32,019
Cost per 1,000 tons hauled 100 miles of all kinds of oil and waste $	.124	.217	.240	.208	.227	.226	.209	.225	.233
Coal, oil and waste, cost per 1,000 tons hauled 100 miles $	2.714	3 807	3.860	3.968	4.077	4.116	4.09J	4 145	4.193

and the unsatisfactory nature of the discussions on the subject that have been had at the conventions of the Master Car Builders' Association. With the wheel gage correct and the distance between the backs of the wheels within the prescribed limits, there is still a possible impingement on the point of the frog, and a powerful blow on the guard rail and frog wing, due to variations in the thickness of the flanges, as well as for the reason that the inspection at junction points is necessarily hurried and imperfect and passes faulty wheels.

The amount of the impingement on the frog point, and of the blow upon the guard rail, depends on three factors: First, the gage of the track; second, the width of the space between the rail and the guard rail; and third, the distance from the back of one of the wheels to the gage line of the other wheel on the same axle; and similarly the blow upon the wing rail of the frog depends upon the same factors, substituting in the second the width of the throat of the frog for the width of the guard rail space.

The last of these dimensions, the distance from the back of one wheel to the gage line of the other wheel on the same axle, which includes the thickness of one flange, is the dimension on the part of the wheel which controls the free passage of the wheel flanges past a frog and its guard rail. It is fixed and invariable for any given gage of track and guard rail.

As 4 ft. 8½ in. is accepted as the standard gage, and as 1¾ in. is accepted as the most suitable space between the rail and the guard rail, the distance from the inside of the guard rail to the gage line at the frog is 4 ft. 6¾ in., and this is the fixed limit to which wheels should exactly conform. The rules as adopted in 1896, and up to the present time in force, have reduced the possible impingement on frog point and blows on the guard rail and frog wing to amounts which might almost be considered satisfactory; but this has been done by reducing the limit of variation in the distance between backs and in the thickness of the flange; and these rules are still defective in prescribing these limits independently of each other, instead of recognizing the fact that for every thickness of flange there is one correct distance between backs, and only one.

The result of the adoption of these limits is that while we still get a frog impingement of $\frac{3}{16}$ in., and a guard-rail blow of ⅛ in., we confine the wheel flange within the limits of 1 in., or 1⅛ in. if the wheels are to be remounted, and $1\frac{7}{16}$ in. the maximum thickness for a new wheel; whereas, it is entirely possible to mount wheels with flanges varying from 1 in. to 1⅝ in. with perfect safety, if the distance between backs is made to correspond, and at the same time to eliminate the guard-rail blows.

Under the rules as referred to this cannot be done, for the correct distance between backs for a 1⅝-in. flange is 4 ft. 5⅛ in., which is below the Master Car Builders' limit, and for a 1⅛-in. flange the distance between backs is 4 ft. 5⅝ in., which is above it. With the limits between backs of 4 ft 5¼ in. and 4 ft. 5½ in., it is absolutely impossible to mount wheels correctly that have flanges over 1⅛ in. in thickness, or under 1¼ in., the rules having apparently been framed as if the trouble was caused by the thickness of the flange rather than by the improper mounting of the thick flange, and the effect of the rule is that while the thick flanges are prohibited, the correct use of the thinner flanges is made impossible.

As adequate inspection is very difficult to get, it is important that the original mounting of wheels be accurate. In a series of special inspections made a few years ago it was found that out of 13,000 pairs of wheels, coming from a great variety of railroads, 56 per cent. exceeded the 4 ft. 6¾ in. limit; various other irregularities were found and only 13 per cent. of the cars had all their wheels properly mounted.

Summing up, Mr. Gest said:

It is important first that the wheels be accurately bored, without eccentricity, and at an exact right angle with the plane of the gage line of wheel; there should be no difficulty in securing this by modern methods of shop practice.

The axles should be accurately centered before mounting.

Instead of mounting wheels by the distance between backs, fixed without reference to the thickness of the flange, and varying between limits which can only be used with wheel flanges of certain thickness, there should be one exact distance between backs for each pair of wheels determined by the thickness of the flange, and this distance is in all cases the 4 ft. 6¾ in. limit, as explained above, minus the thickness of one flange.

Wheels to be mounted on the same axle must have their flanges as nearly as possible of the same thickness, the difference in the thicknesses of the flanges not exceeding $\frac{1}{16}$ of an inch; and the thicker flange is to be taken in establishing the distance between backs.

This method of mounting wheels will eliminate all impingements on the frog points, and reduce the blows on the guard rails to the minimum; and will not only do this, but will, at the same time, permit a much greater flange wear than has hitherto been attainable.

The economy secured by this method of mounting in the Maintenance of Way and Car departments will more than repay whatever additional expense may be entailed in our car shops on account of the greater care required in mounting. Although, by the adoption of narrow limits, the bad effects of improper mounting may be diminished, guard-rail and frog-wing blows will never by that means be entirely removed.

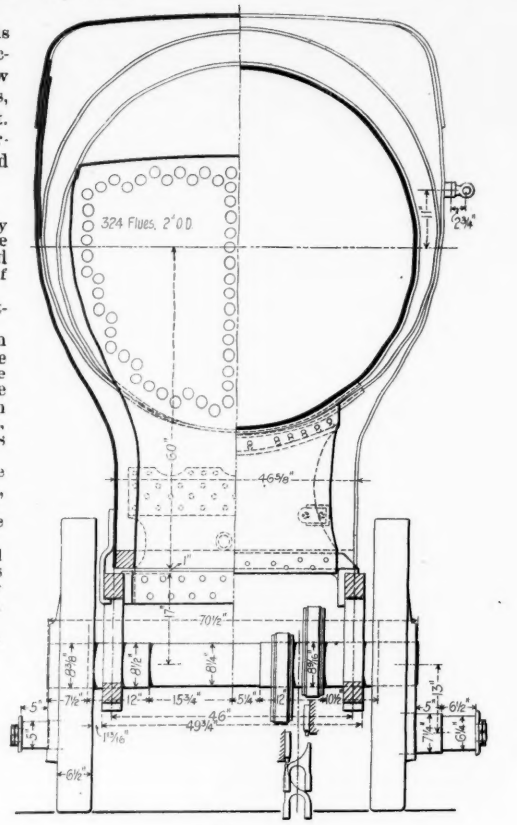
Until this method of mounting wheels is universally adopted by all the railroads of the country, the Roadway Department will continue to have their frogs battered to pieces by badly fitted car wheels; whereas, by conforming to this rule, nearly all of the destructive blows may be eliminated; and it is hoped that with the general adoption of this method of mounting wheels, one of the greatest difficulties with which the Roadway Department has had to contend will be overcome.

Brooks' Twelve-Wheelers for the Buffalo, Rochester & Pittsburgh.

The Brooks Locomotive Works has built for the Buffalo, Rochester & Pittsburgh three 12-wheel locomotives for heavy service on steep grades. One of the cuts is an engraving made from a photograph, while the others show an elevation and sections of one of the engines.

The cylinders are 21-in. diameter by 26-in. stroke; the diameter of the drivers is 55 in.; the weight on the drivers is 140,500 lbs., and the total weight in working order is 172,000 lbs. The total wheel base of the engine is 25 ft. 5 in.; the driving-wheel base is 15 ft. 6 in., and the total length over engine and tender is 62 ft. 1¼ in.

The boiler is of the Player improved Belpaire type, designed to carry a working steam pressure of 180 lbs., having a diameter of barrel of 68 in. The material used in the construction of the boiler is Carnegie steel. There are 324 charcoal iron tubes 2 in. in diameter and 12 ft. $7\frac{5}{16}$ in. long.



Sections of Brooks 12-Wheeler.

President, the chief of these subjects being permissive blocking and the question of interlocking train order signals with other signals where the former are located within interlocking limits. This committee consists of H. M. Sperry, G. H. Macdonough (Erie) and C. L. Addison (L. I.).

Another committee consisting of A. H. Rudd (N. Y., N. H. & H.), W. W. Young and Frank Rhea (P., C., C. & St. L.), was appointed, and to it were referred all questions in Mr. Sperry's paper having to do with the details of construction of interlocking apparatus. Among these subjects are the design of switches, the proper method of attaching head rods, the use of selectors, etc.

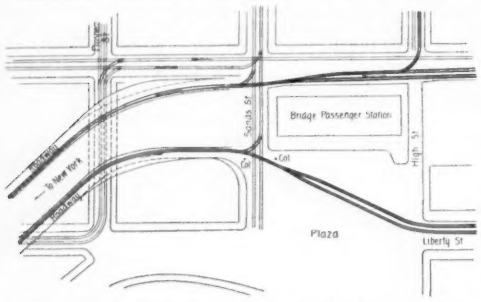


Fig. 1.—Probable Connection of Brooklyn Electric Lines with Bridge Tracks.

The question of the location of distant signals was referred to the committee first named, that on Derailing Switches, and the question whether it is desirable to make a change in the form of spectacle castings is to be dealt with by the Secretary, who will ask the views of members by letter ballot, in connection with the question of colors for night signals.

On Wednesday the Club went by invitation of the Lehigh Valley Railroad to Easton, Pa., and visited the works of the National Switch & Signal Co. The members were shown through the shops. Many interesting details of construction of interlocking machines, were made known, and the work followed from the rough castings as received from the foundry to the finished machine ready for operation. The type of machine and the style of locking supplied by this company are tolerably well known, but in its present practice several improvements have been made; the weight of moving parts has been lightened and the friction largely diminished by isolating the locking bars from the frame, and making as few bearing points as possible.

Ingenious special machinery, most of which is made on the premises, is provided for shaping and fitting the different parts, so as to make all the pieces of a particular kind exact duplicates, so that when the machine is assembled all the parts must come exactly to their place without special adjustment. Several machines, varying from a few levers to one to contain 255, were under construction, or ready for shipment. The engineering department was visited with particular interest, and drawings, data and methods of applying them in practice, of records and their preservation, were exhibited. A simple and efficient slotted signal was shown, and the "Train Staff" apparatus was seen in operation, also working models of highway crossing alarms both single track and double, and electric locking devices.

A new color and position signal was inspected. This signal is a semaphore in which the arm carries a row of incandescent electric lamps, which, being lighted, give a night signal of great distinctness. By means of a commutator the lamps are lighted one after another, in quick succession, thus producing the effect of motion while still describing the outline of the arm, horizontal or inclined as the case may be. Only one lamp is alive at any one time, thus economizing the current.

The visitors were afterward entertained by a trolley ride to the Paxinosa Inn, where an excellent luncheon was served. The Club returned to New York at four o'clock.

On Thursday a number of the members went to Hartford, Conn., to see the signals of the New York Division of the New York, New Haven & Hartford and the interlocking plant at the crossing of the New England Railroad, at Hartford. They were entertained by Mr. Rudd of the Hartford Division and Mr. Beach of the New York Division. The Hartford plant was described in the *Railroad Gazette* of Aug. 14 and Nov. 27, 1896. It is equipped with electric locking designed on the general plan of that shown in the *Railroad Gazette* of Sept. 10, page 629. From Hartford a trip was taken on the third rail electric car to New Britain and thence to Berlin, where the power-house was inspected. All of the passenger trains of the New Britain branch, which extends from Berlin to New Britain, two miles, are now run by electric power.

The Accepted Plans for Electric Cars on the Brooklyn Bridge.

The original plan for building a deck above the present cable car platform to accommodate the passengers from the trolley cars at the New York terminal station of the Brooklyn Bridge has been abandoned and in its place has been substituted a very simple and practical solution for this seemingly different problem. Besides reducing the expense of reconstructing the present station, the new and accepted plan will make it possible to shorten the time required to make the necessary preparations to run the electric cars across the bridge.

Fig. 1 shows the course which it is proposed that the cars will take in passing to and from thebridge in Brooklyn. They will enter by Washington street, and the new tracks will be laid on the side of the roadway nearest the footway. The present plan provides for the cars going from the bridge to pass over the Plaza to Liberty street.

The most important feature of the entire plan is the arrangement for loading and unloading the passengers at the New York terminus. A study of the drawings in Fig. 3 and a few words of explanation may make this clear. The present brick walls at *A*, *B*, *C* and *D* and at A^1, B^1, C^1 and D^1 will be removed, thus making a passageway for the cars around the loop, as shown in the figure. The movement of the electric cars at the New York side will be regulated about as follows: Supposing four cars are standing at the center of this loop and receiving passengers. The first car from Brooklyn will come to the point marked *A* and stop, the second to *B*, the third to *C* and the fourth to *D*. As soon as the last car has arrived all will move forward together, and at the same time the loaded cars will move to the points A^1, B^1, C^1 and D^1, and from there proceed separately over the bridge. While the cars are in motion the foot passengers will be prevented from crossing the tracks. The time which they will thus be delayed will be 30 seconds less than a quarter of the entire time in which the gates will be open for passage to and from the bridge. Should any of the foot passengers object to crossing these tracks two other means may be provided. In the first place a tunnel is planned, placed underneath the tracks, as shown in the figure, and in the second place an outlet will be provided by passing up the stairs very near Park Row, and following along the gallery deck until the existing footway surface is reached. At present there is but one stairway with a platform, which is best seen in the elevation, Fig. 2. Additional stairways will be built, if required, shown as S^1 in Fig. 3.

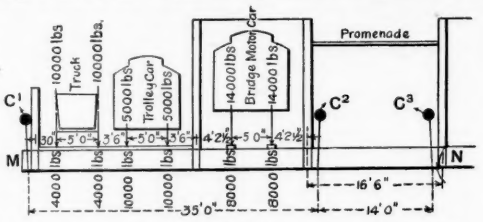


Fig. 4.—Cross-Section of Bridge Showing Maximum Loads Allowed

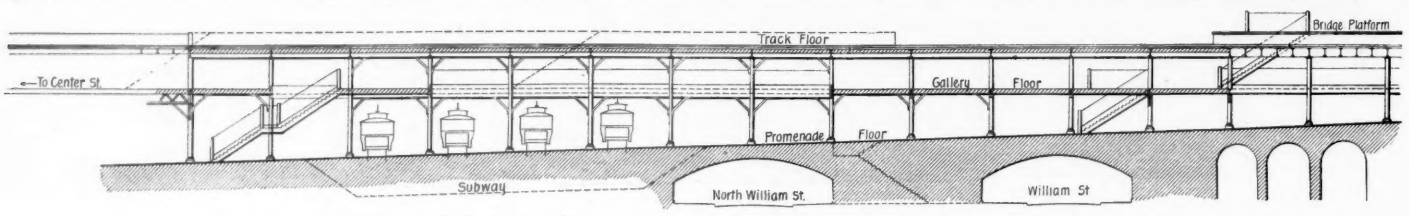


Fig. 2.—Longitudinal Section of New York Terminal Station of Brooklyn Bridge.

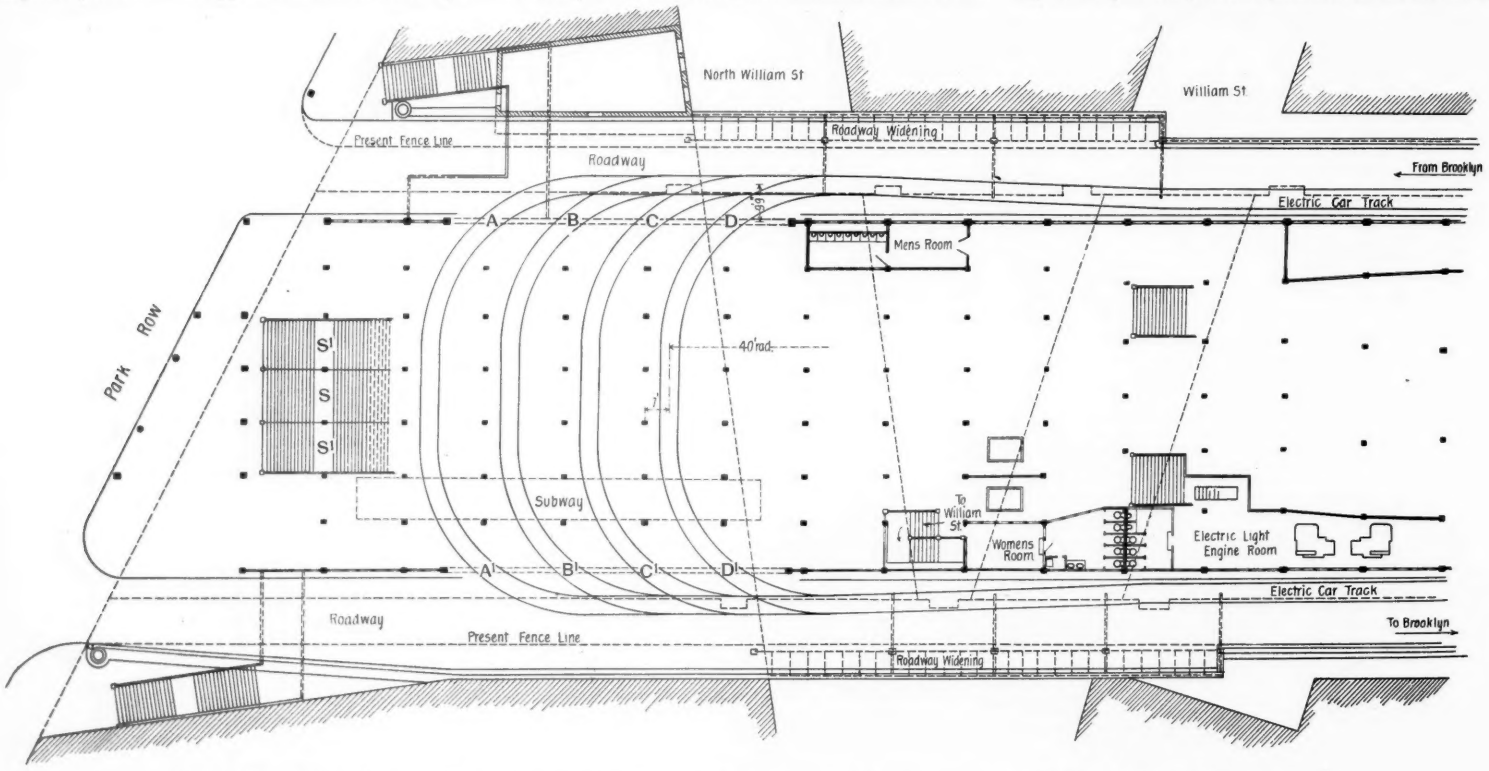


Fig. 3.—Plan of New York Terminal Station, Brooklyn Bridge, Showing Proposed Arrangements of Tracks for Brooklyn Electric Cars.

Originally, the plan provided for the street car tracks to be laid on the outside of the roadway, inasmuch as it had been thought that the outer cables should be required to bear any extra load that might be placed on the bridge. This reasoning, however, was found to have little bearing in the final consideration, inasmuch as the extra weight on the middle cables will be about the same, whether the extra weight of the car was on the outer or the inner side of

the roadway. This may at first seem paradoxical to some, but a satisfactory explanation is easily found. The suspended structure (at right angles to the four supporting cables) on which rest the roadway and the present car tracks are quite r'g'd, having a lateral brace l and a stiffened truss, so that a load on any portion is distributed to all the cables, though, of course, not equally. A model made to show this can be seen at the engineer's office of the bridge. A light hard rubber piece is supported by small scales at points corresponding to the places of support of the suspended structure, and a weight placed successively at different points corresponding to the different positions on the roadway shows clearly by the readings on one of the small scales which support the rubber piece that an extra load on the inner side of the roadway will not strain the inner cable nearest the load practically any more than if the same load was placed at the outside of the roadway. When a rigid piece is substituted for a flexible rubber piece, and a weight is placed in different positions, the scales which are located in position corresponding to the positions of the inner cables, C^2 and C^3, Fig. 4, give readings nearly the same as when the flexible piece is used. This simple experiment is quite conclusive, and the results justify the present intention of running the cars on the inner side of the roadway.

Fig. 4 is a cross-section of the bridge showing the location of the tracks and roadway and indicating by the figures above the wheels of the truck and cars the maximum loading which will be allowed for the different points. The ordinary working load on a double truck does not exceed 3,000 lbs. on each wheel, thus leaving a margin of 2,000 lbs. for each wheel for the heaviest truck that would ordinarily cross the bridge. Similarly, with the electric and the present motor cars, the maximum load allowed on the bridge will be very much larger than the average load that will at any time be on the bridge. The figures below the suspended structure, *MN*, are from the Chief Engineer's report of Jan. 9, 1882, and shows the maximum loads at the different points which the bridge is capable of sustaining. A careful study of these figures should be sufficient to settle the question conclusively in regard to the safety of the bridge with the extra loading from the trolley and bridge motor cars which will pass over the br'dge.

The Paint Test by the Department of Public Works, New York.

The Department of Public Works of New York, Mr. Edward P. North, Mem. Am. Soc. C. E., Consulting Engineer, began somewhat over a month ago what must prove to be a very efficient paint test, the results of which will be made public.

The test is being made on that part of the 155th street viaduct which crosses Eighth avenue, over the top of the 155th street station and the tracks of the Manhattan Elevated road. This portion of the viaduct is a level plaza, and is carried over the street by 17 riveted truss girders 69 ft. long. The bottoms of these girders are 20 ft. above the railroad tracks. The girders themselves are about 9 ft. deep, and carry on their upper chords the 16-inch I-beams and the ⅜-inch buckle plates forming the floor of the viaduct. These trusses, the floor beams and the under sides of the buckle plates are directly exposed to the fumes and gases of the elevated engines, which move up and down the tracks at this point almost constantly.

The whole of this metal-work was painted one coat in the shop and another as soon as erected in 1892. These were followed about a year later by two more coats, applied about a month apart. All of this painting was practically destroyed by the time the present work of repainting was begun.

In repainting it is proposed to make a test of the relative efficiencies of different paints. Seventeen different paint makers have each been assigned a part of the metal-work to paint. The portion allotted to each one consists of a girder, together with the floor beams and buckle plates lying half way between it and the next adjacent girders, making in all about 3,000 sq. ft. to each concern. All of the conditions existing at the place were presented to the several makers, and they were left free to meet these conditions as they chose. There was no limit set to the number of coats, neither was there any particular color required. Each maker applies his own paint and every advantage has been given the painters to do as good work as they know how. That the comparisons may be complete, however, the amount of each kind of paint used is taken into account and also the time required to apply the several coats.

In order that all of the paints sh ll be tested under exactly the same conditions the city is cleaning all the iron work by sand blast. The sand-blast plant used to remove the old paint and scale from the iron consists of an upright boiler and a 10 × 12 in. and a 12 × 12 in. Ingersoll-Sergeant air compressor placed on the viaduct floor of the span being painted. A 2½-in. iron pipe carries the air from the compressors down to a reservoir situated on a tight tongued and grooved-board platform which is suspended about 18 in. below the lower chords of all the trusses. From this receiver the air passes to a Tilghman's sand blast apparatus. This consists of two No. 6 mixers, which are connected with $\frac{9}{16}$-in. nozzles by about 50 ft. of 2½-in. rubber hose, and one No. 4 mixer, connected with its nozzle by about the same length of 1½-in. hose. The mixers consist of a cylindrical shell closed at the ends, inside of which there are two hoppers, one above the other. An opening in the top end of the cylinder which is of the form of an inverted cone and one in the bottom of the upper hopper are closed by valves operated by stems extending through the upper head of the mixer. These valves are for the admission of sand, and together with the upper hopper and the top of the cylinder form an air lock in the top of the mixer. From the upper hopper the sand passes down into the lower one, which is made of sheet-iron, and is like a funnel held free from the walls of the lower chamber of the mixer. The bottom of this lower one is connected with the discharge pipe which extends horizontally into the lower chamber of the mixer. A small stream of sand falls from the lower hopper into this pipe and is blown out of the mixer into the hose connecting with the nozzle by the compressed air which enters the lower chamber by a pipe connected with the air reservoir. The air pressure used is 20 lbs. per square inch, and it takes 168 cu. ft. of air per minute to run one nozzle when it is new and the opening measures $\frac{9}{16}$ in., and about 275 cu. ft. per minute when the nozzle is worn so that the opening measures ¾ in. in diameter. About ⅛ cu. ft. of sand is required per square foot of surface cleaned. This sand is gathered up from the platform and used four times before it is thrown away. The sand-blast apparatus in use at the viaduct, requiring eight men altogether to operate it, will clean about 800 sq. ft. of the riveted truss girders, floor beams and buckle plates a day when the two $\frac{9}{16}$-in. nozzles are used. The sand blast is run from six o'clock in the morning until three o'clock in the afternoon, after which time the paint is applied. In this way the iron work which has been cleaned is painted the same day before the fumes from the locomotives and the moisture of the air have had a chance to rust it.

The sand blast leaves nothing to be desired in regard to the thoroughness with which it removes the old paint, rust and scale from the iron. The cost of cleaning by this method is greater, however, than that by the means usually employed, but the result is better, for it leaves the metal entirely exposed. Whether the advantages to be derived from so thorough a removal of all foreign matters from the surface of the iron for the purpose of painting outweigh the extra cost of cleaning remains to be seen. The use of the sand blast in the case of a test like this one is, no doubt, the most satisfactory way of cleaning that we know about. The present cost of cleaning a square foot of the metal work of the viaduct is about 13 cents. The cost will probably come down to 10 cents a square foot before the work is finished. And it is estimated that the cost of cleaning an entire structure like the viaduct, which would have a surface of about 600,000 sq. ft., would be about 7½ cents a square foot, including scaffolding.

Besides a comparative test of different paints under the same conditions, the present test will also give some information in regard to the durability of the same paint when applied to surfaces of a somewhat different character, that is of different degrees of cleanness. Some parts of the iron work have been cleaned with steel brushes and then painted; while others, after being cleaned by the sand blast, have been allowed to rust for definite periods before the paint was applied.

While the paints selected for this test are only a small part of all the different kinds made, still those chosen are typical of nearly all the others, a fact which will enable engineers to compare any paint they may be using with others of the same or different general composition. Careful chemical analyses are made of each kind of paint also with the view of further aiding comparisons.

The engineers of the Department of Public Works are keeping full data regarding the whole undertaking, the cost of cleaning, the cost of painting and all the conditions under which the work is done, with the view of giving the results to the public. The total cost of the test as it is being carried out will be about $7,500. The total amount of surface being painted is about 50,000 sq. ft.

Meeting of the Traveling Engineers' Association.

The Fifth Annual Meeting of the Traveling Engineers' Association was held at the Chicago Beach Hotel, Chicago, commencing Tuesday, Sept. 14, and lasting four days. Eighty-one members were in attendance and eight reports were presented by committees and discussed. The subject "Injectors" was also discussed, although not presented in the form of a report. Representatives of the various manufacturers of injectors took part in this discussion.

The meeting was called to order Tuesday morning by the President, Mr. C. B. Conger. Mr. Charles S. Thornton, Corporation Council of the City of Chicago, opened the meeting by an address of welcome, taking the place of the Mayor, who was absent from the city. President Conger followed with an address in which he reviewed the work done by the Association and pointed out the progress made, calling especial attention to the increase in membership during the last year. The reports of committees were then taken up.

The entertainment of the members while not in session was provided for by a Committee of Arrangements consisting of Mr. R. D. Davis, Traveling Engineer, Illinois Central Railroad, Mr. James Fitsmorris, Master Mechanic, Union Stock Yards & Transit Co., Mr. S. W. McMunn, Mr. F. D. Fenn, Air Brake Department of the Crane Co., and Mr. J. S. Seeley, Galena Oil Works, Ltd. In addition to numerous trips to points of interest in and about Chicago, the shops of the Chicago & Northwestern Railway were visited and the working of the locomotive testing plant witnessed. An invitation from Mr. Wm. Renshaw, Superintendent of Machinery of the Illinois Central, to visit the Burnside shops, could not be accepted by the association of account of a lack of time.

The reports which were presented at this meeting are given by the following abstracts:

REPAIRS AND ADJUSTMENT OF AIR-BRAKE EQUIPMENT WHILE ON THE ROAD.

Committee consisted of Messrs. T. A. Hedendahl, F. P. Willson, George T. Wells, S. J. Kidder and F. N. Risteen.

Directions are given for locating while on the road the most common defects in air-brake equipment, the manner of testing for same and, as far as possible, the most available remedy. In this report the failures of the air-pump, air-pump governor, engineer's valve and driver brakes are separately treated, as are also failures arising from leaks in piping, air-hose, auxiliary reservoirs and brake cylinders. Failures of the brakes through improper adjustment of the brake shoes resulting in excessive piston travel are considered, and the following limits placed on the allowable piston travel:

For passenger cars and tenders, 6 in. to 8 in. or 7 in. to 9 in.

For freight cars (standard gage), 5 in. to 9 in.

" " " (narrow-gage freight brake), 4 in. to 6 in.

For driver and engine truck, indefinite.

Air brake defect cards are recommended for use on freight cars, while the failure of air-brakes on passenger cars should be reported by telegraph or by other direct means.

THE CARE, MAINTENANCE AND ECONOMICAL OPERATING OF METALLIC PACKING.

Committee consisted of Messrs. J. A. Gibson, P. K. Sullivan, H. A. Fike, Chas. Davis and E. W. Knapp.

This report is made up from replies to a circular letter, the answers in many cases being very contradictory. All fairly agree, however, on the following points: It is desirable to use metallic packing for piston and valve rods because such packing is more economical and gives better service with less wear to the rods than the older forms of packing. For the packing rings almost any white metal, such as babbit, can be used, a set of rings in one case making 50,000 miles in ordinary passenger service. The mileage of the rings depends entirely upon the care taken of the packing, the lubrication, class of service, and whether the road is ballasted. Metallic packing gives satisfactory service when used on air-pumps.

HOW SHOULD A LOCOMOTIVE BE OPERATED TO SECURE THE BEST ECONOMY OF STEAM AND FUEL?

Committed consisted of Messrs. W. E. Widgeon, N. S. Moore, J. W. Graham, Geo. W. Wilden, J. T. Wilson.

These points can be included under three heads.

First.—The skillful manipulation of the different valves and levers that control the engine.

Second.—Skillful firing.

Third.—Education of engineers.

From a theoretical standpoint a locomotive, under all conditions, should be worked at the shortest possible cut off with wide open throttle, thereby saving heat and fuel by working the steam to its fullest expansion. However, practice has taught the engineer that this rule does not hold under all conditions; that it is not always the most economical method where the speed and the weight of the train are considered. It is plain that any imperative rule tending to interfere with the engineman in regard to working his engine under all conditions, would be expensive and injurious to the service. If the time is fast the throttle should be opened wide when starting and the speed regulated by means of the reverse lever, but the engineer cannot be governed by any fixed rule, and should exercise his judgment. Care should be taken not to force the engine into speed faster than necessary to make schedule time, avoiding an unnecessary increase of speed for the purpose of making up time before it is lost.

The style of boiler that has the greatest capacity, and will carry water highest when the engine is working at its fullest capacity, is, from an economical standpoint, the most advantageous. The larger the body of water carried, the less the pressure will be effected by the entering feed water, and the greater advantage may be taken by the engineer to favor the fireman in cases of emergency. The engineer should bear in mind that upon good pumping depends a great deal more than simply carrying enough water to prevent the burning of the crown sheet. From an economical point of view, it is important that the fireman should know just where the water line is in the boiler at all times, and it is now being advocated by some traveling engineers that the fireman should do the pumping. This might apply to some engineers, but would not be necessary when the engine was handled by a skillful and competent man.

The action of the fireman when applying coal should be slow and deliberate, never allowing himself to become flustrated, so as to expose the fire to a cold draught longer than necessary. He should avoid, as much as possible, putting in coal when the engine is starting the train, and endeavor to get his fire in a few moments before starting. This will give him an advantage by keeping the fire door closed when the engine is laboring into speed, when the blast on the fire is the heaviest. Shaking of the grates depends, to a great extent, on the kind of coal used; with all bituminous coal it is necessary to shake the grates often to insure perfect combustion.

The word "shaking" does not simply that the grates should be shaken vigorously each time, or turned upside down; it simply means that they should be moved several times, and returned to their regular position. Allowing the fire to go without moving the grates until it becomes necessary to turn them upside down in order to attain relief, is very detrimental, as the good fire is shaken into the ashpan, leaving the clinker in the fire-box still intact. By frequently moving the grates, the combustion is made so perfect that the greater part of the refuse that would form into a clinker is either consumed by the intense heat or thrown out of the stack.

As everything pertaining to the economical management of the locomotive depends on the training of the enginemen, the effort should be equally as great in their development as that used in bringing the locomotive up to its high grade of efficiency. Enginemen should be given every opportunity and encouragement to study the many good books and periodicals concerning their work and other lines, which will serve to broaden and expand their minds, thus making them economical, safe and efficient. In the hiring of men for firemen, young men should be chosen who possess the natural qualifications requisite to graduate them into a higher degree.

THE PREPARATION OF COAL FOR LOCOMOTIVES AND THE PROPER TOOLS.

Committee consisted of Messrs. D. R. McBain, F. P. Slayton, W. C. Hayes, H. L. Stephenson and W. R. Johnson.

This report is in the form of answers to a circular letter. Coal should be prepared before being put on the locomotive tender. Hard lump coal should be broken to a maximum size not exceeding a 3-in. cube, and lumps of soft coal, which cannot be taken out under the coal grate, should not be put on the tender. The reason why coal should be of a proper size when delivered to the tender is that a fireman cannot break coal as fast as a modern passenger engine will burn it and at the same time attend to his other duties. In this way large lumps of coap are put into the firebox, which necessitates a heavy fire in order to make steam; also the large lumps are not burned economically.

A mixture of coarse and fine coal is to be preferred to straight lump coal, as it makes a closer and hotter fire and permits of carrying a thinner fire on the grates. The wetting of coal on the tender is recommended as a matter of cleanliness and for preventing the fine particles of coal being carried direct to the flues. The tools which should be furnished each engine are as follows: Shovel, coal pick, hoe, rake and in cases where the coal is inclined to clinker, slash bar and finger auger.

IS THE BRICK ARCH AN ECONOMICAL ADJUNCT TO A LOCOMOTIVE?

Committee consisted of Messrs. J. Donovan, I. R. Baer, C. H. Stalker, D. Meadows and J. W. Reading.

This report is in the form of answers to a circular letter. Brick arches have more advantages than disadvantages, and it is believed that failure or success of the brick arch depends largely upon the way in which it is applied, and the conditions under which it is used. Brick arches are being used in all classes of engines, being either supported by arch pipes or by pegs screwed into the side sheets. The arches are located from 1 to 11 in. below the bottom row of flues, according to the depth of the firebox. The life of a brick arch is variously stated as being from one to six months, and the cost reported varies from $3.50 to $16.25 each, including labor and material. Brick arches are generally thought to produce some saving in coal and in the life of the flues, but definite figures are not given. By a majority the brick arch is thought to prevent black smoke. Little trouble is reported from the cracking of side and door sheets on account of the arches.

DUTIES OF ENGINE AND TRAINMEN IN TESTING AIR-BRAKE EQUIPMENT.

Committee consisted of Messrs. D. C. Woods, J. A. Kershaw, F. Keenan, W. T. Hamar, F. L. Hain.

These duties include a careful examination of the equipment on the engine and tender at the end of a run and a report of any defects. On the following trip, before leaving the roundhouse, it should be ascertained whether the defects reported have been remedied. Although there is some difference of opinion, it is thought by the committee that the handle of the engineer's valve should be in lap position when coupling the engine to a train. The train test of brakes should never be made at reduced pressure, especially at terminals where car men are supposed to adjust the piston travel. Such a test would cause trouble, as the resulting piston travel would not be uniform, owing to differences in the construction of the cars. When cars are taken into train a test of brakes should be made to prove that they are in working order, and also the equipment should be inspected for leaks.

If lapping the valve while coupling is done in every case no failure to open the train-pipe cocks could escape detection if the gage were carefully watched. It is obvious that excess pressure is not a necessity on short or medium length trains, but from the fact that modern brake valves are constructed with a view to always maintaining excess pressure, and also from the fact that even with short trains at times excess pressure may be required, it is believed that excess pressure should always be carried.

After proper examination, and any defects found and remedied, a still further examination should be made after the brakes have been applied, to ascertain any defect in their proper working.

On most passenger and some freight cars, if the hand brake is partially applied, it shortens the piston travel, and engineers have often been censured for sliding wheels in such cases. Besides, the brake is often rendered useless on account of the air escaping through the leakage groove. Trainmen should be careful regarding this point. It should be the duty of trainmen to notify the engineer if any air-brakes are cut out, especially on a short train.

LUBRICATORS UNDER HIGH STEAM CHEST PRESSURE AND OTHER AUTOMATIC APPLIANCES FOR OILING CYLINDERS AND VALVES.

Committee consisted of Messrs. I. H. Brown, P. H. Stack, C. B. Hodges, J. Minor, J. W. Graham.

The idea of employing sight feed lubricators is not faulty, as these instruments are the results of study and experiment, and are very successful in performing their duty of delivering regularly a small amount of lubricant, which may be nicely controlled. The trouble is beyond the lubricator, and lies in the pipe system employed through which the oil is expected to pass in a downward sloping course from the lubricator to a point 6 or 7 ft. below it to the steam chest. The oil feeds well enough when the throttle is closed, and when it is aided by vacuum, but the difficulty begins when the throttle opens and the steam but little lower than boiler pressure is admitted at the steam chest end of the pipe. The increase of working boiler pressure during the last few years has been blamed for the trouble, but from experiments recently made it appears that it exists with pressures very much lower than those commonly carried to-day. The reason why the oil does not go through the pipes regularly is interesting At the opening of the throttle, steam at very near boiler pressure is forced up into the long oil pipes where it condenses nearly filling the pipes with water so that the lighter oil cannot get down through the water under these conditions. A small part of it may get through on account of the churning of the water in the oil pipe. It is well known that the old hand oilers, when placed in the cab, would not feed against the steam pressure from the chest, and why should the automatic lubricator be expected to do so? In stationary and marine practice the automatic lubricator is usually placed directly upon the steam pipe or steam chest, or with the connecting pipe, when one is used, so short that condensation will not interfere with the operation. In marine practice it has been found necessary in using the rising drop sight feed to place the lubricator below the cylinder and to arrange the oil pipe so as to be nearly vertical, with no dipping bends, and even then it has been found necessary to use a pipe not smaller than ½ in. in diameter. The working of this device depends upon the fact that oil is lighter than water, volume for volume.

The trouble is at times due to the piping of the lubricator on account of having a steam pipe of too small inside diameter. The connection to the boiler should be a pipe at least $\frac{7}{16}$ in. inside diameter and we do not believe ⅜ in. would be too large. This pipe should be connected directly to the boiler, and not to the fountain or turret to which the air-pump, blower and other steam using attachments are connected, as there are very few turrets that will keep a steady pressure on the lubricator; we have found none as yet that will.

The replies to a circular letter show that the trouble experienced with lubricators is general and not confined to localities, any one make of lubricators, or to modern locomotives carrying high steam pressures. A great many trials have been made by placing a glass in the oil pipe above the steam chest, all of which show the same results, that the flow of oil is intermittent and depends on the difference in pressure between the boiler and steam chest. It is desirable to connect the steam pipe supplying the lubricator direct to the boiler and not to the turret. This pipe should be given sufficient incline to drain any water in the pipe toward the boiler and away from the lubricator. Balanced valves under high steam pressure are not more difficult to lubricate than plain valves. No trouble is experienced in lubricating the valves of engines when working slowly with a long cut-off, because of the amount of fluctuation in the steam chest pressure. For the proper working of the lubricator full boiler pressure must be maintained on the lubricator.

The Nathan and Detroit attachments recommended by the Nathan Mfg. Co. and Detroit Lubricator Co. are described, but as very few members had experimented with them no data are given. A device brought out by Mr. A. E. Manchester, Assistant Superintendent of Motive Power of the Chicago, Milwaukee & St. Paul Railway, is also described.

The discussion which followed the reading of the paper would go to show that while somewhat better results are obtained when the special attachments mentioned are used, still the question has not yet been satisfactorily settled.

THE BROWN SYSTEM OF DISCIPLINE.

Committee consisted of Messrs. G. W. Gould, J. B. Johnson, Geo. Gregory, J. R. Belton and A. L. Moler.

This report describes the system of discipline started about ten years ago by Mr. Geo. R. Brown, General Superintendent of the Fall Brook Railway, and already familiar to readers of the *Railroad Gazette*. Several railroads in adopting the Brown system have made certain modifications which are brought out in the report. For instance, the Chicago & West Michigan keeps a record of the service of each employee, but instead of grading violations of the rules in *days of suspension*, as in the Brown system, *marks* are given, 60 marks constituting cause for discharge. On this road a certain number of marks are entered against the record of an employee for each offense and double the first number for a repetition of any offense. For 12 consecutive months of service free from demerit marks or reprimand 10 marks are deducted from the record against an employee.

It developed during the discussion that while the *Brown System* has been found to be satisfactory to the men on those roads where it is used, the modification of the Brown System wherein the record is kept by recording a certain number of marks for each offense is not popular with the employees. In conclusion the Committee states that it is apparent to them that the Brown System has successfully passed the experimental stage and gives the opinion that its adoption by all railroads would tend to raise the standing of the employees and result in more safe and economical operation.

The committee on subjects to be considered at the next meeting, consisting of Messrs. W. R. Scott, M. W. Burke, R. H. Stack and D. R. McBain, recommended that only five subjects be discussed at future meetings. The Committee presented the following eight subjects, from which the Executive Committee will select five. These will be brought up in the form of committee reports at the 1898 meeting.

SUBJECTS FOR 1898.

1. Lubrication of locomotives.—The best methods of reducing hot bearings to a minimum with the least amount of oil.
2. The use of water in hot bearings of engines and tenders.—Is it advisable and to what extent used? In using water for hot driving or engine truck boxes, is it used on top or side of boxes?
3. How can the traveling engineer best instruct and assist the firemen in the economical firing of the engines?
4. How can the consumption of coal be reduced per ton-mile?
5. Does the location of track and station signals in any way affect the safe and economical operation of locomotives?
6. Is the Brown System as it was originally insti uted your idea of a method of discipline without punishment? If not, what would you consider the best modification?
7. What is the best method to be pursued by traveling engineers in giving air-brake instruction while on the road?
8. Uniformity of cab fittings and their arrangement with a view of accessibility and utility.

Before adjourning the association decided that the next meeting would be held in Buffalo, N. Y., the date to be settled by the Executive Committee and announced later.

The officers elected for the ensuing year were as follows: *President*, Mr. D. R. McBain; *First Vice-President*, Mr. W. T. Hamar; *Second Vice-President*, Mr. W. R. Scott; *Third Vice-President*, Mr. M. W. Burk; *Secretary*, Mr. W. O. Thompson; *Treasurer*, Mr. W. R. Johnson.

Mr. C. B. Congor, the retiring President, was elected as member of the Executive Committee for three years, the other two members being Mr. J. H. Brown and Mr. T. A. Hendendahl.

No action was taken in the matter of holding the future meetings of the Association in connection with those of the Association of Railroad Air-Brakemen.

EXHIBITS.

At the recent meeting of the Traveling Engineers' Association at the Chicago Beach Hotel, Chicago, the following devices were exhibited:

Wm. Sellers & Co., Philadelphia, Pa. Locomotive injectors.

Nathan Mfg. Co., New York. Locomotive injectors and sight feed lubricators.

The Hayden & Derby Mfg. Co., New York. No. 9 Metropolitan injector.

H. W. Johns Mfg. Co., New York. Samples of asbestos covering for boilers and steam pipes. Vulcabeston (vulcanized asbestos) packing and insulating material in various forms for use as packing or as gaskets.

Stannard & White, Appleton Wis.—The "Brotherhood" cab seat for locomotive engineers and folding bathtub.

Ashcroft Manufacturing Co., New York.—Steam gages, pop valves and other special locomotive appliances.

The Hancock Inspirator Co., Boston, Mass.—The "Hancock" locomotive inspirator, ejector for use at water stations, boiler check and hose strainers.

The Pyle-National Electric Headlight Co., Monadnock Block, Chicago, had on exhibition at the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn Street, a complete electric headlight in working order which was shown to members of the Association.

The New Shops of the Peoria & Eastern at Urbana.

The Peoria & Eastern Railway, one of the leased lines of the Cleveland, Cincinnati, Chicago & St. Louis, is now making extensive improvements at Urbana, Ill. The Railway Company has acquired 57 acres of ground on the north side of the main tracks outside the 100-ft. right of way line, where entire new shops and yards are now being built. The work of putting in the foundations of the buildings, coal wharf and water tank is being done by the Railway Company, and bids have recently been received from contractors for the erection of the buildings and other construction work. The present shops and yards are on the south side of the main tracks, and this ground, together with the present tracks, will be used for a bulk delivery and storage yard.

Fig. 1 shows the general arrangement of the new buildings and the shop tracks proper. The new yard for handling freight cars will be a gravity yard and located east of the shops. As seen from Fig. 1, the following shops are connected so as to form practically one building: The smith shop, boiler, erecting, machine and tin shops, toolroom, lavatory, engine, boiler and mill rooms. A contemplated future extension of this building is shown on the plan and will be used as a paint-shop and paint storeroom, an upholstery-room and car-shop, but it is not expected that this addition will be built for two years. In a separate building are the Master Mechanic's office, the storeroom and oilroom. The plans also provide for a new roundhouse, turntable, coal wharf and water tank in addition to the new yards, previously mentioned, on the north side of the tracks east of the shops.

The plan of the main building is given by Fig. 2 and the elevations of typical portions are shown by Figs. 3, 4 and 5. All foundations under the walls and pillars of the buildings and the foundations for the coal wharf

and water tank are constructed of concrete. The concrete is made of Ludlow Falls stone, mixed with Louisville cement, excepting for the top 10 in. in which Alsen cement is used. The water table and coping above the concrete are of planer-dressed Indiana Oolitic limestone. The walls of the buildings are of reddish-brown second quality paving brick. From the top of the foundations to the top of the walls of the shop buildings is 22 ft. 10 in. All the buildings excepting the

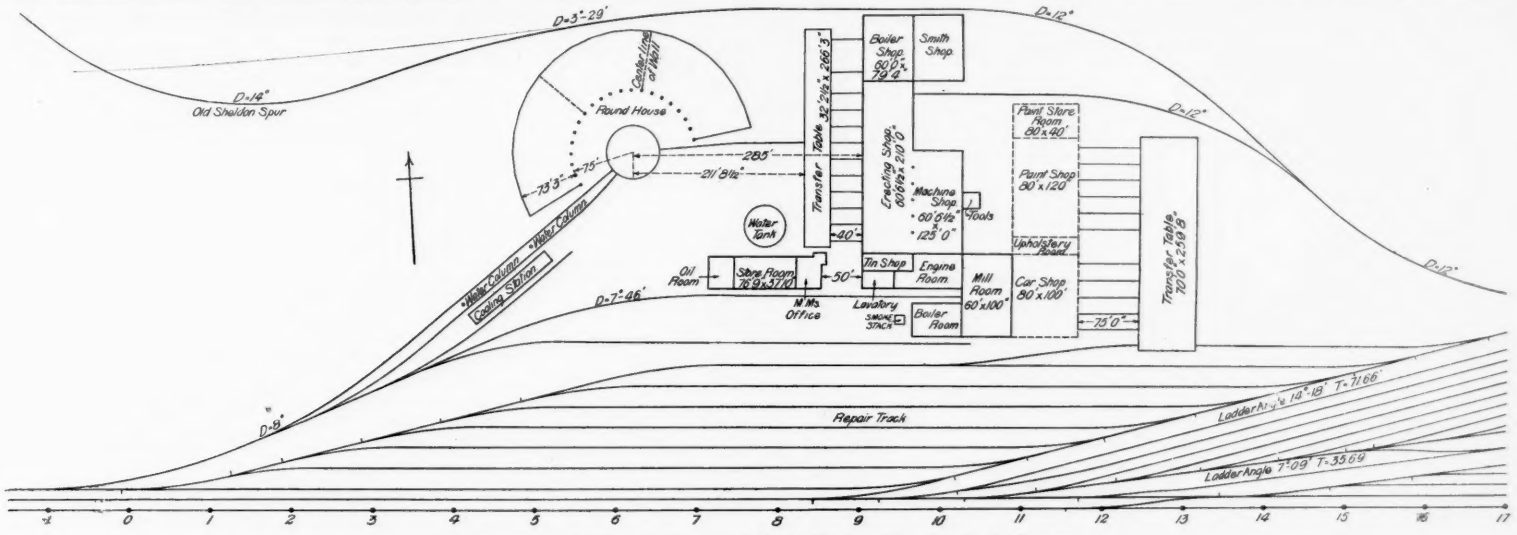


Fig. 1.—General Plan of Shops and Yards, Urbana, Ill.—Peoria & Eastern.

smithshop are lighted by means of skylights in the roof in addition to the numerous windows and doors in the side walls; there are two ventilators in the roof of the smithshop.

The style of roof truss used for the smith, boiler and erecting shops is shown by Fig. 6. The trusses used in the mill roof are not so heavy as the ones illustrated, but the style is the same, the only difference being that lighter members are used. As the office and storeroom building is but 37 ft. 10 in. between walls, the trusses for this roof are constructed of smaller shapes and with fewer panels and less bracing than the trusses of the shop roofs. As seen from Fig. 6, the shop roof trusses are 60 ft. 6 in. out to out with 20 ft. rise, and 20 ft. clear height beneath, and are spaced 20 ft. center to center. The tie beams consist of two 12-in. 20-lb. steel channels placed back to back, and held apart by ½-in. filling pieces. In the same way the main rafters are made up of two 6 in. × 4 in. × ⅜ in. steel angles, the vertical braces consist of two flat bars 3 in. × ⅜ in. and

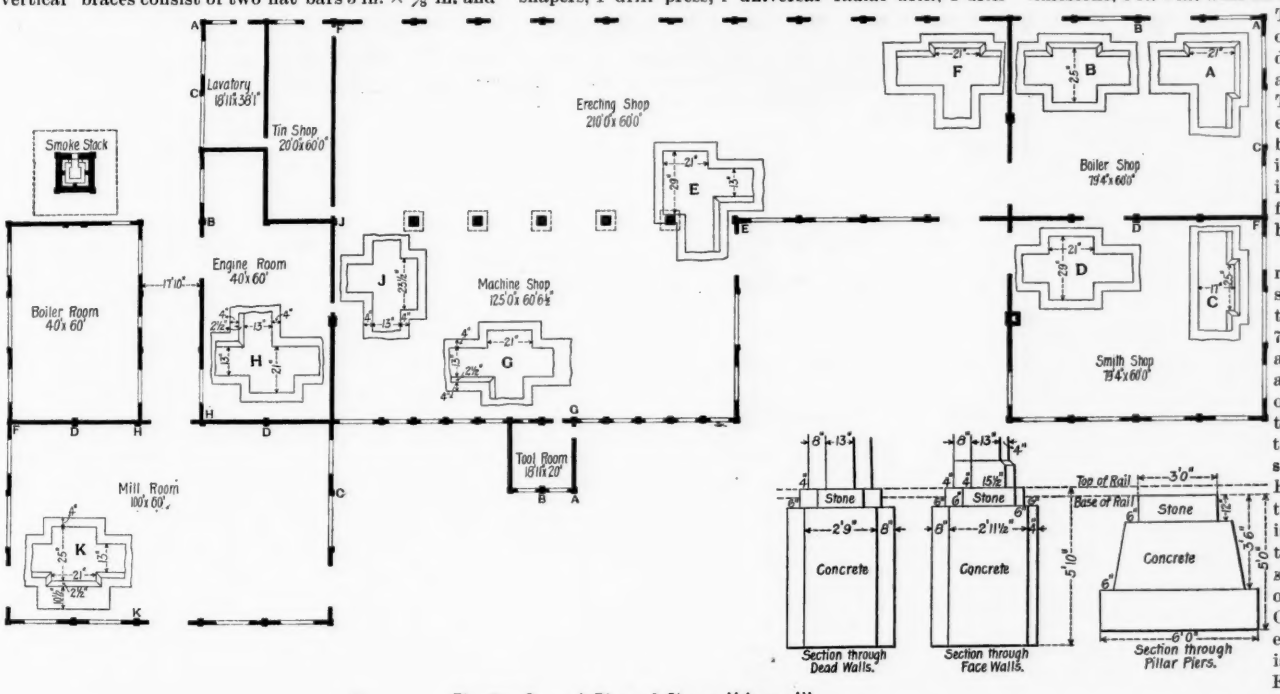


Fig. 2.—Ground Plan of Shops, Urbana, Ill.

the diagonal braces of two steel angles 3 in. × 2 in. × ¼ in. Steel fillers ¼ in. thick are placed between the parts making up the several members, with the exception of the struts where no filling pieces are used; at the joints ½-in. steel plates are used. The rivets are ¾ in. in diameter. The purlins are 8-in. 20-lb. steel I-beams, and where their length is 25 ft. 4 in., as occurs in places in the erecting shop, the upper purlins are trussed, as shown in Fig. 6. The common rafters are 2 in. ×6 in., notched 1 in. on the purlins, to which they are joined by U bolts. The rafters are spaced 2 ft. center to center. Above the rafters is a covering of 1-in sheeting, upon which the slate roofing is laid. The gutters are formed of sheet copper. The ends of the trusses rest on ¾-in. rollers, which in turn are carried by two thicknesses of $\frac{5}{16}$-in. steel plates placed on the wall.

The office and storeroom is shown by Fig. 7, and consists of a one-story brick building having one room 29 ft. 5½ in. × 37 ft. 10 in., to be used by the Master Mechanic for an office; a storeroom 76 ft. 9 in. × 37 ft. 10 in., and and an oilroom 29 ft. 5½ in. × 37 ft. 10 in. The store and oil rooms both have concrete floors 6 in. thick. The oil will be stored in tanks.

The smith and boiler shops are each 60 ft. × 79 ft. 4 in. The smith shop will be equipped with 14 forges, one large steam hammer, one furnace for heating heavy iron, and a bolt furnace. Near all fires used for heavy work cranes and hoists will be fitted up.

The boiler shop has two engine pits and will be supplied with one combination punch and shears, one Hertz flue welder, one No. 2 bending clamp, one set of hand bending rolls, one set of power bending rolls, one drill press, one flue cutter, and suitable hoists and cranes.

The erecting shop is 210 ft. long by 60 ft. wide. The machine shop opens into the erecting shop and is 125 ft. long by 61 ft. 1 in. wide. On the east side of the machine shop is the toolroom, 18 ft. 11 in. × 20 ft. The erecting shop has 10 engine pits similar to the ones used in the roundhouse, shown in Fig. 13, excepting that the erecting and boiler shop pits are 34 ft. long inside and the distance from the bottom of the rail to the floor at the front end is 2 ft. 7⅛ in., instead of 2 ft. 10 in. The machine shop will have 11 lathes, 2 double-head driving wheel lathes, 1 turret lathe, 4 planers, 2 shapers, 1 drill press, 1 universal radial drill, 1 drill table, 1 car-wheel boring machine, 1 hydraulic car-wheel press, 1 hydraulic driving wheel press, 1 slotting machine and 3 bolt cutters.

The tin shop is 20 ft. by 60 ft., and will be equipped with the tools usual in such shops.

The mill room is 60 ft. by 100 ft., and will have 1 No. 5 universal wood worker, 1 No. 6 large mortise and boring machine, 1 No. 1 rip saw, 1 No. 3 long cut-off saw, 1 No. 4 Egan band saw, 1 No. 5 scroll saw, 1 No. 4 wood lathe, 1 planer, 1 knife grinder and 1 Egan band saw, set and clamp.

The larger part of the tools for the new shops will be moved from the present shops, but some new machinery will be purchased.

The engine-room is 40 ft. wide by 81 ft. 11 in. long, and the boiler-room is 40 ft. by 60 ft. The engine-room will contain a stationary engine, an air compressor and a dynamo. It has not been decided at this time what type of engine, compressor, dynamo and boilers will be used, but new ones will be provided.

Adjoining the boiler-house is a square brick smokestack, 100 ft. high measured from the top of the foundation. The foundation is 13 ft. 4 in. in depth. The first course of the foundation is first-class masonry, 26 ft. square by 2 ft. thick, upon which are two layers of 8-in. 18-lb. steel I-beams, laid in concrete, 19 in. center to center. Above the I-beams are five courses of first-class masonry 2 ft. thick; the first course is 17 ft. 9 in. square and those above are stepped off 6 in. for each course, so that the top of the foundation is 13 ft. 9 in. square. The weight of the stack alone is 466.5 tons, while the total weight, including the foundation, is 762.5 tons. The outside of the stack has a batter of $1\frac{1}{2}$ in. to 1 ft. and at the base is 13 ft. 1 in. square, while the opening for gases is 3 ft. 7¼ in. square throughout, the space between the inner and outer walls varying from 4 to 12 in.

The erecting and boiler shops are served by a transfer table. Fig. 8 shows sections through the pit at the ends and center. The pit is 32 ft. 2½ in. wide by 266 ft. 3 in. long, and the table is carried on five rails spaced 7 ft. 5⅝ in. center to center. Directly under the rails are concrete foundations, 2 ft. 6 in. deep, and 1 ft. 6 in. wide; the rails are laid on and are secured to the concrete by means of clips, made of ⅜-in. iron, which are in turn held in place by ¾-in. square head bolts set in the wall. Around the edge of the pit is a coping of Indiana Oolitic limestone, 1 ft. 6 in. wide on top, and 1 ft. 6½ in. high. The floor of the pit consists of a covering of sand 6 in. deep, upon which is placed a 6 in. course of concrete. The pit is drained from either end toward catch-basins at the center, which in turn are drained by an 8-in. cast-iron pipe. The transfer table will be operated by an electric motor.

Fig. 9 shows a plan of the roundhouse together with sections through the foundations. There are 20 stalls 73 ft. long, each containing a pit 43 ft. long. The outer and intermediate walls are of brick 13 in. thick, while the ends of the roof trusses, toward the turntable, are supported on iron columns. From the top of the walls to the top of the foundations is 28 ft. The foundations for the walls and columns are shown in Fig. 9 and consist of concrete capped with Oolitic limestone. The end elevation of the roundhouse is shown in Fig. 10, while Fig. 11 shows portions of the side elevation front and back.

The roundhouse roof construction is shown by Fig 12, and consists of 19 wooden trusses, each having a span of 64 ft. 3 in. The cross-tie timbers are 10 × 12 in., the truss rafters and diagonal braces are 10 in. × 10 in., and the vertical struts are iron rods. The purlins are 15 in. deep and 4 in. and 6 in. wide. The common rafters are 2 in. × 4 in. placed 18 in. center to center. One-inch sheeting is used above the rafters upon which a 3-ply slate roof is laid.

Fig. 13 shows the construction of the roundhouse pits, which are similar to the pits in the erecting and boiler shops. The foundations for the walls are concrete, 2 ft. wide, and varying in depth from 1 ft. 4 in. to 5 ft. 4 in. for different stalls, depending upon the nature of the ground. Upon the concrete the pit walls, 1 ft. 6 in. wide and 3 ft. 2 in. high, are built of Oolitic limestone. The rails are fastened direct to the masonry. The floor of the pits consists of a 4-in. course of concrete upon a 6

in. layer of sand. The pits drain toward the front, where catch-basins are provided.

As seen from Fig. 9, there is a 65-ft. turntable in front of the roundhouse. The consolidation engines used on this road are 59 ft. 9 in. from the pilot to the back end of the tender, while the 10-wheel freight engines are 59 ft. 2½ in.

The turntable center rests on an Oolitic stone base 6 ft. square and 2 ft. 6 in. deep, which in turn rests on a foundation of concrete 4 ft. deep and 8 ft. square. The pit rails are carried directly on stone ties 8 in. × 8 in. × 3 ft. long. These ties, together with the Oolitic limestone wall surrounding the pit, rest on a foundation of concrete 3 ft. deep and 5 ft. 2 in. wide. The floor of the pit is a 3-in. course of concrete above a 4-in. layer of sand and slopes toward the center where a catch-basin is located. The catch-basin is drained through a 6-in. cast-iron pipe. It is the intention to use an electric motor for operating the turntable.

The coal wharf will be similar to the one at Wabash, Ind., on the Cleveland, Cincinnati, Chicago & St. Louis Railway, with some recent improvements; the Wabash plant was described in the *Railroad Gazette*, July 17, 1896. Coal, sand and cinders will be handled mechanically at the wharf.

The water tank is to be constructed of cypress, to have a capacity of 100,000 gals. of water and will be supported on a steel frame. The foundations for the supports will be Oolitic limestone masonry built upon concrete. The bottom of the tank will be 50 ft. from the top of the pedestal, or about 53 ft. above the base of the rail in the roundhouse. The water will be taken from a stream near the shops and pumped into the tank by means of an 8 in. × 12 in. × 14 in. steam pump. The shops and roundhouse will be fitted with water pipes throughout and a complete system of mains and hydrants will be located about the building for protection against fire. The tank will supply the water for the locomotives, the stationary boilers and the various uses about the shops. Steam ejectors will be used to heat the water for washing out locomotive boilers.

All the shops and the roundhouse will be piped for compressed air. The shops will be heated and ventilated by means of air conduits, and the roundhouse will be heated by steam. The buildings and shop grounds will be lighted by electricity.

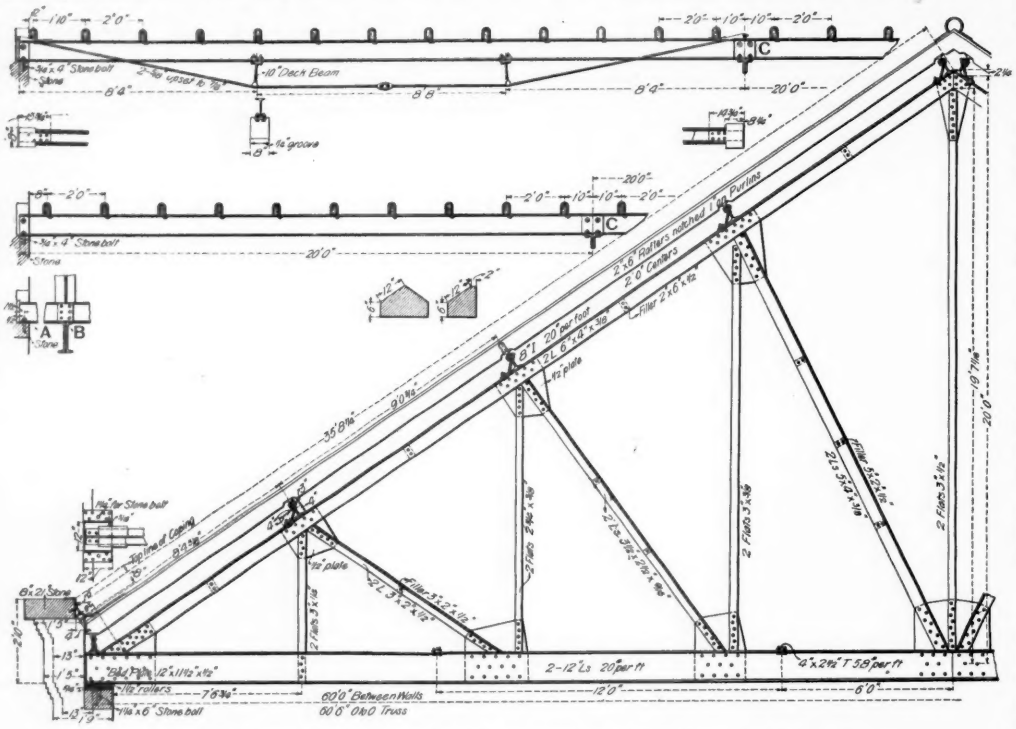


Fig. 6.—Roof Truss, Smith, Boiler and Erecting Shop—Urbana Shops

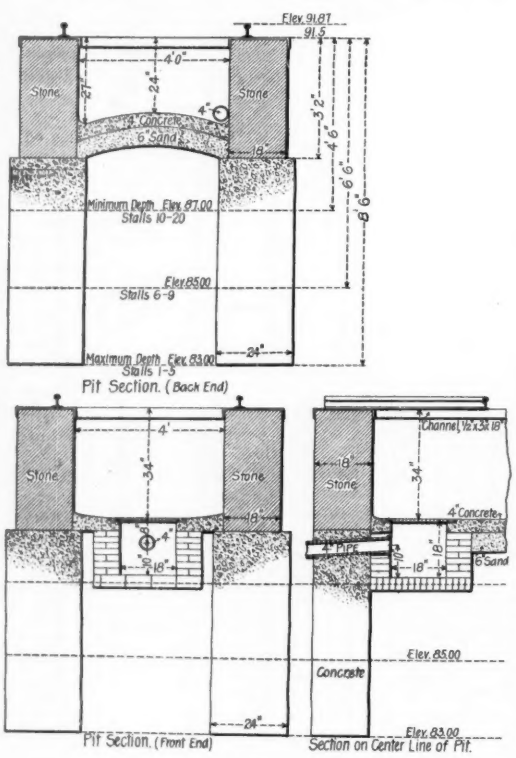


Fig. 13.—Round House Pits—Urbana Shops.

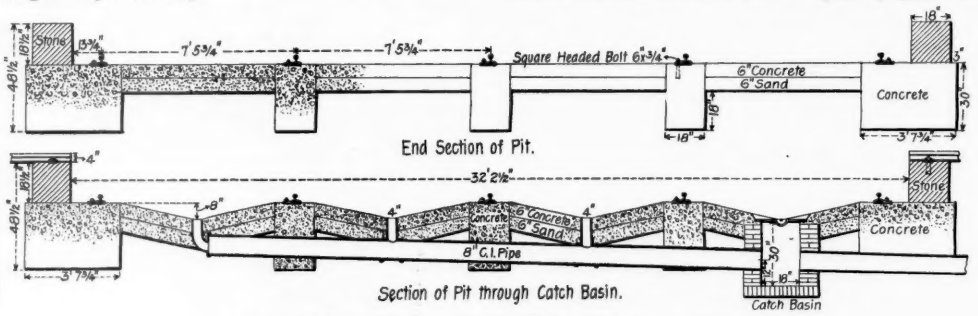


Fig. 8.—Sections Through Transfer Table Pit—Urbana Shops.

The plans of the shops and yards were prepared under the direction of Mr. C. A. Paquette, Engineer Maintenance of Way, and we are indebted to Mr. J. A. Barnard, General Manager of the Peoria & Eastern, for drawings and information.

Convention of the New York Street Railway Association.

The 15th annual meeting of the Street Railway Association of the State of New York was held at Niagara Falls, Sept. 14, 15 and 16. President J. Tracy Rogers, of Binghamton, called the meeting to order on Tuesday morning, and on roll call it was found that there was the largest attendance in the history of the association.

A delegation of prominent tramway men was there from abroad. The first paper was on the subject, "How can we Increase the Efficiency of Employees," by Mr. W. Wheatley, of Brooklyn, N. Y., an abstract of which will be given later.

Mr. J. B. Cahoon in discussion said: On our road in Elmira we not only go into a thorough examination of the man as to his personal character and habits, etc., but put him in the power house and give him a training there, and follow that up with a course in the machine shop and car house, and endeavor in that way and through careful training on the cars to put him in a position to understand what his duties are. We have also established a club room with the daily papers, electrical papers and prominent magazines. This is at a very convenient point, and we hire a room for that purpose solely on one of the principal streets of the city. In addition to that we have taken the men into our confidence, so to speak, and when there has been a falling off in the earnings we have talked with the men in a general way and explained to them how our daily receipts depend upon them, how if they are not polite to ladies and do not help them on and off the cars and answer inquiries politely and promptly they are hurting the road, and not only the road, but themselves because if our earnings decrease, it means we have to decrease our operating expenses. We have also adopted the service stripe system. We give a man for each five years of service a gold stripe on his sleeve, with an increase in pay of five cents a day, which is not much, but it serves as an incentive to the men, and shows that they are considered, and that we are trying to do what is right by them.

The next paper was "A Decade of Electric Railroad Development," by Mr. W. J. Clark, of New York. This also will be published later by abstract.

The first paper Tuesday afternoon was by Mr. Caryl D. Haskins, of Boston—the "Economical Influence of Accurate Electrical Measurements," an abstract of which will be given later.

Mr. Cahoon: How much does the meter cost?

Mr. Haskins: The 35 amperes, 500 volts, is $40; the 50 amperes, 500 volts, is $50; with a discount of 50 per cent.

Mr. Cahoon: We do not know whether we can afford these luxuries or not.

Mr. Haskins: It is a necessity, not a luxury.

The President: Where have those meters been adopted?

Mr. Haskins: The meter has not yet been adopted by any road. It has not yet been offered on the market. It has just gone through its final test in our hands. It has been running on the Lynn & Boston road over the roughest section of their line.

The next paper was on "The Advantages of a Car Mileage Record," by T. J. Nicholl, of Rochester, followed by "Facts and Fancies of Railroads," by Mr. W. W. Cole, of Elmira.

Facts and Fancies of Street Railroads.

The municipality is a public business corporation; the railroad a private business corporation; but both are in the service of the public with this distinction—if the municipality makes mistakes in its management, the public must pay; if the railroad company is mismanaged, the individuals pay, and the public is still carried for the same price. Now, if any large manufacturing corporation should approach the Board of Trade of any city in the United States, and make a proposition to locate interests that would increase the comfort and possibilities of usefulness of many citizens, make suburban homes available, and values of real estate higher, make houses rent more readily and for greater values, and homes in the city to become more desirable, and homes in the country of easy access, increase the trade of the various business interests, and to open up parks and furnish free amusements to the public, to guarantee that they would employ a certain number of men at wages generally higher than paid by the local mercantile interests, and that they would give constant and permanent employment at all times to a large number of men—to such a concern the business men of any city in the country would offer a bonus in cash, land for a site, and concessions in taxes; and should such an industry meet with reverses, it would be the common interest to give them general aid. Yet all these things have been done by the average railroad company.

The value of franchises, the possibility of lower fares or better service, the advisability of city ownership, and all such problems can only be answered intelligently by the results already obtained. In Huddersfield, England, the financial statement does not indicate any great diffusion of wealth from municipal ownership of street railroads. The operation of the lines for the year ending March 31, 1895, resulted in a defficiency of £2,473. Each year of the 14 years of its history this tramway has run at a loss varying from £671 in 1882 to £16,636 in 1893, involving a total loss of £62,220. This has been met by transferring £20,982 from depreciation account, leaving only £340 to represent the depreciation of 14 years. The remainder of the deficit has been made up by special taxes ranging annually from ⅛ of a penny to 5 pence in the pound, and costing the rate payers £41,238.

For the year ending March 25, 1895, tramways show a profit at Leeds of £133 7s. 5d. after paying expenses, which include £131,305 interest and sinking fund.

After providing for interest and sinking fund, the tramway in the last fiscal year lost £1,086. In December, 1896, the system had only just been completed. And the employees of these roads are contented citizens at very low wages. A factor which plays an important part in European schemes of municipal ownership is the low rate of interest which they would have to pay on the money spent in purchasing the railroads.

The Englishmen secure poor service at low cost, and all Europe observes a policy which retards the rapid development that all America demands. In this country the street railroad has made it possible for the working-

man to own a cheap, comfortable country home, and he can reach his work within the city in 20 or 30 minutes for five cents, with a ride of seven or eight miles. In Europe the workingman for two cents is transported perhaps a mile in 10 or 15 minutes from a congested tenement house to his work in a thickly populated district. There is an impression that railroads are generally overcapitalized, but when a real knowledge of facts is obtained it is found that all roads constructed in the earlier days spent vast sums in the purchase of apparatus, and again, on the reconstruction which was necessary, to give the public the benefit of rapid improvements. This money was honestly expended, and to-day the public has the benefit of a liberal policy in the clean, well kept, up-to-date service generally rendered. And the men who have spent their money and time in perfecting this service are entitled to remuneration for both the service in actual operation and those benefits they have made possible throughout the land.

The next paper was by Mr. H. S. Newton, of Syracuse—"Track Bonding. How can we Obtain the Best Results?" Abstract of this will be given later. A summary of this discussion follows:

Mr. MCNAMARA: I ask the writer whether an attempt could be made to get six times the conductivity of the area of the bond wire.

Mr. NEWTON: We get nearly 10 times. The contact between the bonds and the rail is made through a plate at the terminal at each end of the bond, which is so designed as to have about 10 times the surface of the cross-section of the wire itself. The bond has six times the area of the cross-section of the copper conductor and comes in contact with an equal surface of the rail. The 0000 wire has contact terminals cast on the ends of the wire which are soldered to the web of the rail. There is a bond terminal cast on the copper about 2¼ in. diameter.

Mr. MCNAMARA: There is no one thing that street rail road men give more attention to than the perfect bonding of the tracks. Not only for economy in operation, to utilize all the power generated, but to get rid of large claims for damages by reason of electrolytic action. I am sure if no other paper had been read to-day than the paper read by Mr. Newton I would feel repaid for coming here.

The paper by M. C. L. Rossiter, of Brooklyn, "Advantages of Up to Date Street Railroad Service; Why the Rate of Fares Should not be Reduced," was next.

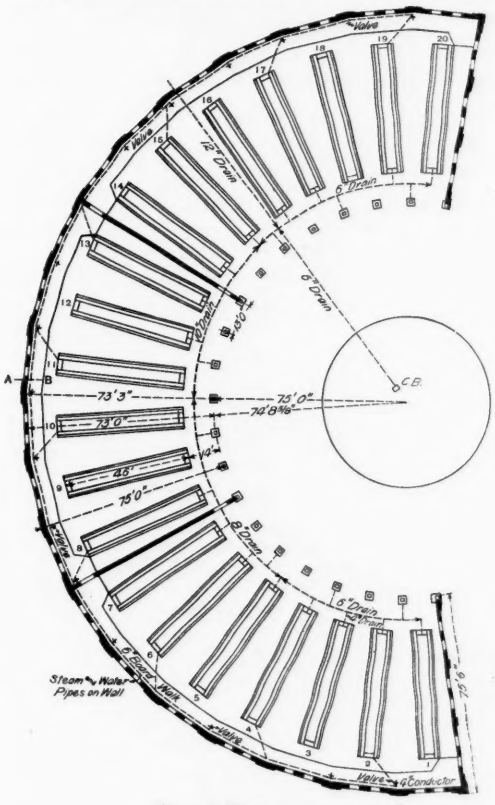
ADVANTAGES OF UP-TO-DATE STREET CAR SERVICE.

. . . Some figures in regard to Boston are very instructive showing as they do in the case of Brookline, a suburb of Boston, that in the 30 years from 1855 to 1885 the increase in value was from five and one-half millions to sixteen millions, while in the next five years, with the introduction of the street railroad, the value increased to thirty millions. Another case that will illustrate this has occurred in Brooklyn. During the year 1896 one of the roads constructed an extension some three miles in length through an entirely new territory where the streets for blocks had not been cut through and no improvements whatever made to the adjoining property. To day, less than a year since the road was opened, there have been over 500 houses built (nearly all of them being occupied as soon as completed) on the line of this street and adjacent side streets. If it had not been for the railroad extension not one of these houses would have been built, and it can be readily seen that it is not the railroad company which will reap the first benefits, but the city, which will have increased its assessment roll not less than $3,000,000 in the present year. . . . To secure the needed funds for extensions and improvements of our electric roads, there must be a perfect understanding between the city and the owners of these properties. If the city places unnecessary burdens and taxes on the roads that cannot be met, then those who are called upon to furnish the capital will refuse to do so and the city will be the loser tenfold over what it could possibly gain in any other way. . . .

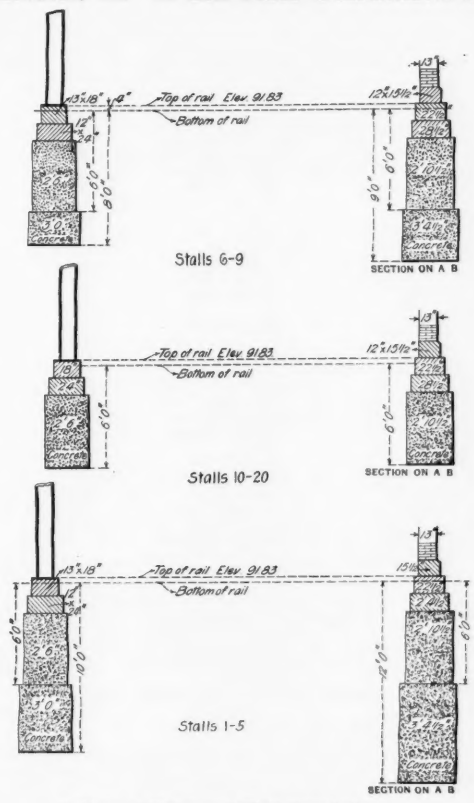
In regard to fares they have been reduced, and to-day the street railroads of this country are carrying passengers a longer distance and at cheaper fares than in any other country in the world. The distances in the 10 largest cities in this country where the public is carried for a single fare of five cents range from 9.9 miles to 18 miles: this latter in Brooklyn. In horse-car days a ride of five miles for a single fare was a long one and the average was below this. The railroads in Glasgow, Berlin and some other foreign cities are frequently referred to as furnishing lower rates of fare. This is not so. The average and usual rate in England is two cents for the first mile and one cent for each mile thereafter, and this works injury to the laborer and artisan classes. In his country the average rate is from ¼ to ½ cent per mile and in many cases less than ⅛ cent per mile. Abroad five representative cities average 11,099 population per mile of track. Seven of the largest cities in this country average 2,127 population per mile of track. This means that the laboring classes and artisans abroad are compelled, on account of the high rates of fare to the suburbs, to live in the crowded quarters of the city. . . .

Mr. J. P. E. Clark read the paper by Mr. Robert Dunning, of Buffalo, on "Repair Shops," which we hold for a later issue.

A brief meeting was held on Wednesday morning, at which no business was transacted, and the meeting adjourned so that the delegates might take a trip to Lewiston, etc. At three o'clock in the afternoon the meeting reconvened, and the paper by Mr. H. H. Vreeland on "Municipal Ownership" was then read.



Ground Plan.



Sections of Pillar and Wall Foundations.

Fig. 9.—Round House—Urbana Shops.

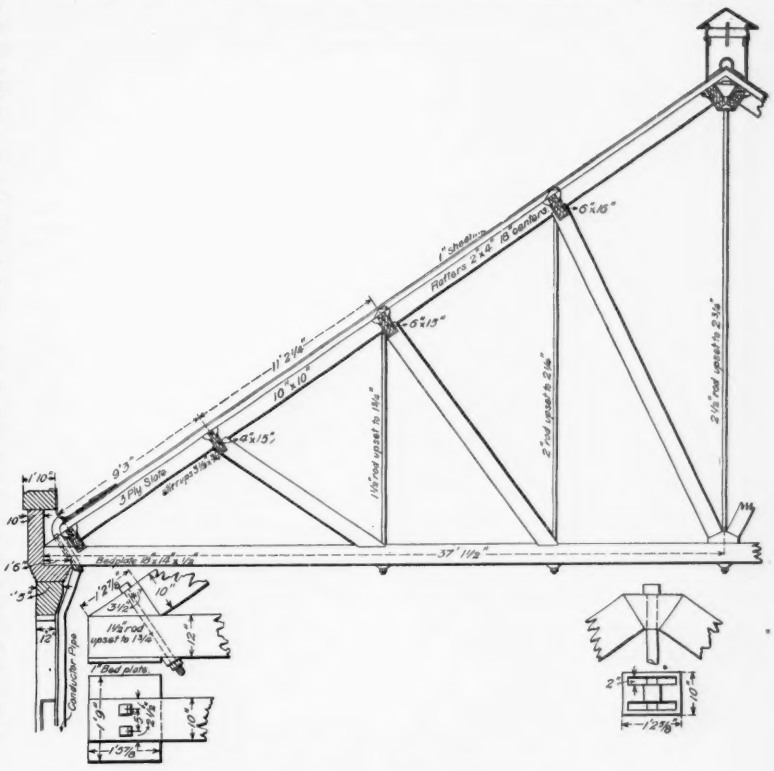


Fig. 12.—Round House Roof—Urbana Shops.

and discussion by orators, editors, legislators and university professors.

A singular feature of the voluminous literature the question has provoked is its single-sidedness. Those most vitally interested in the debate have not been heard. It is fair to suppose that during the years in which they have held undisputed control of public attention, the advocates of the doctrine have fully stated their case, and so it seems to me that at this time we are advantageously placed to view the whole of the claims made by them. In attempting to classify these claims, one is surprised, in reviewing the discussion, at their number and diversity. Here it is claimed that hours of labor of employees would be reduced; there, that wages would be increased; then, that in the hands of a set of men to be changed with every varying political wind, life would be made safer in cities; some one else explains how fares could be reduced and greater civility assured. The lack of unanimity is startling. On two points only are they all agreed, to wit: That something must be done to deprive the railroads of their property and rights; that something must be done to relieve the people from wrongs under which, demagogues and agitators complain, they suffer. . . . The Association for the Public Control of Franchises, in its last circular, dated July 18, 1897, declares that:

"According to the most conservative authorities, half the city's revenue could be derived from its street car, gas and other franchises. In this event, taxes upon private and personal property would be cut in two."

"What is even more important to the mass of our citizens, public control of transportation and illuminating will lead to a *similar* reduction in car fares and gas bills."

The city's annual revenue, according to the report of the Comptroller for the year ending August 1, 1897, amounted to $104,449,390 derived as follows:

Taxes	$41,877,841.00
General fund	2,222,195.60
Appropriation account	241,393.00
Special and trust accounts	8,622,409.00
Loans	51,485,552.00
Total	$104,449,390.00

Let us subtract the item of the loans in the above table and state the total revenue at $52,963,838, which is the amount minus that item.

"According to the most conservative authorities, half the city's revenue could be derived from its street car, gas and other franchises."

In other words, it could get $26,481,919, provided that the taxes still remained at $41,877,841. But unfortunately, this amount is to be reduced, as "Taxes upon private and personal property would be cut in two." How the city is to grow rich by a reduction of its revenue is explained in the second clause I have quoted from the circular. It is to be brought about by "a similar reduction in car fares and gas bills." An ordinary city, if its revenue from *taxation* was reduced fifty per cent., would have to increase the revenue derived from other sources in order to make both ends meet; but here it is proposed to perform the operation by reducing to one-half the only other available source of revenue. In other words, by reducing the revenue fifty per cent. taxes are to be cut in two. . . .

While the claim that municipalities should *operate* franchises may still have some pleaders, they are among the class of place-makers whose motives are so apparently selfish that honest public sentiment gives them no support. . . .

So far as the city of New York is concerned, all that is left of the original claim in favor of municipal ownership

MUNICIPAL OWNERSHIP AND OPERATION OF STREET RAILROADS.

The discussion of this question, which, in the United States, is as old as the oldest franchise grants, has, in the last few years, owing to a singular intemperance of treatment, awakened such interest that the attention of the courts has been directed to it, after its treatment

has been conceded in the normal development of the law, for that municipality now owns such franchises as have not already been given or sold to the highest bidder at public auction. To-day, with us, no franchises can be legally given away. . . . There remains, then, concerning the roads now in operation, the single question of municipalities purchasing back those franchises which they have already given and sold. . . .

If, in the face of the deliberate utterances and warnings of those who have officially investigated the merits of the question, it should still be determined that the municipalities of the State should own and operate the street railroad franchises, the two unanimous claims of the advocates of the doctrine, so far as New York City is concerned, will come up for discussion and consideration in this form:

How is the city to take possession of the property and rights now owned by private corporations?

What improvement can the city make to relieve the public from the "wrongs" which demagogues have invented? . . .

It is quite apparent that the franchise is the element which gives value to the corporate property. . . . The character and nature of a franchise as property has frequently been the subject of consideration by the courts. It has been uniformly decided to be a contract and entitled to protection against legislation which would destroy it, or which by some alteration of the charter would impair its obligations. Corporations are entitled to have the clause of the Federal Constitution liberally construed, so as to secure their franchises every immunity in such respects.

The power of eminent domain . . . can be exercised only under the constitutional limitation, that compensation must be made for all property taken. . . . Municipal ownership of street railroads has never been the policy of this state, and before there can be such ownership the municipalities must be empowered, by appropriate legislation, to acquire and hold such property. . . . In ascertaining and fixing the value, the most important element will be the value of the franchise to maintain and operate the road, and in fixing that due regard must be had and due effect given to the future growth of the locality in which the roads are operated, and the life or term of existence of the corporation owning them, and the reasonable and just expectation which those who have invested money in such property or its securities had in mind when so investing.

It is quite plain that to acquire many of the existing roads in the state would impose upon the cities taking them a large burden of debt and taxation, which, in some instances, it is not improbable, would be entirely beyond the limit of indebtedness which the Constitution imposes upon the municipal corporations of the state.

The answer to the second question will be obvious when I have stated what private ownership and consolidation under the Metropolitan Street Railway system in the city of New York have done for the traveling public in that city.

Nowhere in the debate on this subject have I been able to find, even in the statements of the most heated advocate of municipal ownership and operation, any denial of the fact that the centralizing under single management of the various railroads that make up the Metropolitan Street Railway system has improved the public comfort and convenience. The extent and nature of the benefits which this centralizing has achieved is best shown by the statistics. The following table shows the expansion of its transfer system for the last ten years:

Year.*	Miles of track.	Paying passengers, total number.	Transfer Passengers.		Average fare. (Cents.)
			Total number.	Prop. to paying.	
1896-97	190	177,338 677	56,929,611	32 p. c.	3.78
1895-96	172	145,965,251	28,450,996	19	4.18
1894-95	140	109,686,472	9,671,697	9	4.59
1893 94	131	107,036,524	5,306,654	5	4.76
1892-93	80	63,011,785	3,203,832	5	4.76
1891-92	61	45,239,670	2,645,800	6	4 72
1890-91	37	39,971,929	2,766,080	7	4.68
1889-90	36	39,571,464	2,523,239	6	4.79
1888-89	36	37,386,809	2,206,866	6	4.72
1887 88	36	37,318,730	1,996,871	5	4.75

* Years ending June 30, except 1887-88 and 1888-89, which ended Sept. 30.

From this table it will be noticed that in the first seven years about one passenger out of 15 or 20 received a transfer; in the year 1894-95 one out of every 11 passengers received a transfer; in 1895-96, one out of every five; and in 1896-97 about one out of every three.

The phenomenal development by the company of this great privilege speaks for itself. By means of it the general fare during the whole day has been reduced to 3.78 cents, and during the crowded rush hours of morning and evening, when the working people are going to and coming from their work, the average rate of fare is only 2½ cents. This transfer system, like the lighting of cars and various other improvements, was done without legislative compulsion and in accordance with the settled policy of the company to increase public safety and cheapen transit.

While voluntarily developing this transfer system, the company has also made large contributions annually to the funds of the city and state. . . .

The Comptroller furnished the following table, showing the amounts paid during the year 1896 by the Metropolitan Street Railway Company and the Metropolitan Traction Company:

City Taxes.

Percentage of receipts	$43,101.92
Fixed rental	150,000 00
Car licenses	40,280.00
Personal tax	39,114.27
Tax on real estate	112,607.30
Track taxes	54,489.75

State Taxes.

Percentage of earnings	$90,000.00
On capital stock of Street Railway Co	20,000.00
On capital stock of Traction Co	42,000.00
Total	$591,593.25

In this statement no account was taken of the contributions of the company amounting to over a $100,000, in the shape of repaving and maintaining payments. . . . I have nowhere seen any definite figures presented by the advocates of municipal ownership and operation, so far as it relates to street railroad properties, and I think, when these figures are arrayed, the gentlemen who advocate ownership and operation will hesitate. Roundly stated, the street railroad properties in the city of New York, and they are only a small portion of the franchises proposed to be taken, can be purchased for about $295,000,000. I hardly think that, in the present state of the public sentiment there is any likelihood that the city of New York will take upon itself, by purchase, so great a burden, especially when it is coupled with the danger of expensive management and political opportunity.

Mr. H. S. Cooper then read a paper on "The Prevention of Accidents: The Best Method to Accomplish this End," which will be given in abstract later.

Mr. J. P. E. Clark moved that the remaining papers be read by title. The motion was carried. The papers referred to were "Low Joints: How to Prevent Them," by C. L. Allen, of Syracuse; "Street Car Wheels: Should They be Made Heavier?" by F. D. Russell, of Rochester; "Construction and Maintenance of Car Bodies and Trucks," by Robert Dunning, of Buffalo. Carried.

Mr. J. P. E. Clark: I move that a committee of five be appointed to confer with the Railroad Commissioners of the state for the purpose of framing a set of standard or uniform rules to govern the operation of street railroads of our state.

Mr. A. L. Johnson, Brooklyn: This is the most important matter which has come before the meeting. The framing of just such rules will do more to prevent accidents than anything else. The greatest preventive of accidents is that the men who run the railroads should do the thinking for the employees. We run 150 miles of road. At every bicycle street we have a "Stop" sign; that means stop, not slow up. At 140 different places we have "slow" signs, where children congregate on the street; all cars must keep 200 ft. from the one ahead; there are five dangerous curves, and 200 ft. ahead of the curve there is a circuit breaker, and the lights instantly go down. It takes the action of both motorman and conductor to proceed over the curve, as the latter must change the trolley to the live wire and give the usual two bells. At all street railroad crossings we stop the cars. At the steam railroad crossings our men go across the track and signal the car, as we do not rely upon the flagman. I do not believe it is always desirable to educate your men and keep them for a long time. The most dangerous accidents we have are with old men and not new ones; it is the would-be expert who often gets into difficulties, especially in colliding with other vehicles in taking too many risks. We accept no excuse for a car running into a vehicle ahead of it if the brakes are in good order.

Mr. Clark's motion was put and carried.

The President: I will appoint Messrs. H. H. Vreeland, of New York; C. L. Rossiter and A. L. Johnson, of Brooklyn; H. H. Littell, of Buffalo, and J. W. McNamara, of Albany, as the committee.

The report of the Nominating Committee was presented and the following officers elected: President, G. Tracy Rogers, Binghamton; First Vice-President, W Caryl Ely, Niagara Falls; Second Vice-President, T. J. Nicholl, Rochester; Secretary and Treasurer, Henry A. Robinson, New York City.

Executive Committee: Herbert H. Vreeland, New York City; John W. McNamara, Albany; Henry M. Watson, Buffalo; Clinton L. Rossiter, Brooklyn.

A telegram from Mr. C. L. Rossiter, President of the Brooklyn Heights Railroad Company, Brooklyn, inviting the Association to hold its next meeting in that city, was read. Mr. Johnson, of Brooklyn, seconded the invitation, and assured the Association of a hearty welcome. On motion, the invitation was accepted.

Annual Convention of the Roadmasters' Association.

In our last issue we gave a report of the first and of part of the second session of the fifteenth annual convention of the Roadmasters' Association of America, held at Old Point Comfort, Va., Sept. 14, 15 and 16, together with abstracts of all the committee reports and papers and a complete list of the exhibits.

At the second session, held on Wednesday morning, five more new members were elected. The Committee on "Best Method of Preventing Creeping of Rails," F. J. Allen, C., B. & Q., Chairman, failed to make a report and the Executive Committee was instructed to appoint a new committee to report on the same subject at the sixteenth annual meeting.

The report of the Committee on "Tie Plates, etc.," E. E. Stone, B. & A., Chairman, was discussed and adopted by paragraphs.

Mr. C. E. Jones, C., B. & Q., presented an amendment to the third paragraph to the effect that a tie plate, to take the place of a rail brace, should have a shoulder extending the full width of the plate. After some discussion the amendment was lost.

Some of the members spoke of methods employed by them in imbedding tie plates. Mr. Walter A. Hill, of the Southern Pacific, stated that he had used with success for hard wood a pile driver, with a 3,000-lb. hammer which was allowed to drop from two to three feet. The cost was about four cents a tie. The discussion finally led to the subject of whether a plate was more securely imbedded when driven in the tie with the grain or across the grain of the wood. It was decided to appoint a committee to report on the subject at the next meeting.

The following resolution was adopted: "It is the sense of the association that the tie plate is of great value in a point of safety and economy. While not recommending any special make, we would respectfully suggest that some pattern be used, as the experience of roadmasters in the past has fully demonstrated this fact *i. e.*, economy and safety."

The report of the Committee on "Track Joints, etc" Mr. C. E. Jones, C., B. & Q., Chairman, was then taken up. It was resolved to print the report in the Proceedings of the convention, and a new committee appointed to make report on the same subject next year and incorporate statistics of actual experiences. It was also suggested that the committee endeavor to collect a number of samples of joints removed from track after having been in actual service.

Mr. J. M. Meade, Resident Engineer of the Atchison, Topeka & Santa Fe, stated that for a number of years the road used 38-in. angle bars and finally replaced them with Heath joints. These did not give satisfaction and were replaced again with the 38-in. angle bars covering three ties, making a supported joint. Heath joints were also tried on the Michigan Central, but discarded after six months' service.

Mr. A. S. Weston, Asst. Gen. R. M. of the New York Central, spoke in favor of the continuous joint. He related an instance where continuous joints were applied to 32 miles of track, the rails of which were somewhat battered. In two or three months there was a decided improvement in the condition of the rails.

Mr. James A. Lahey, R. M., Chicago & Northern Pacific, also said that the continuous joint was well liked on his road.

Some instances were given of the efficiency of the Weber joint. Mr. Henry Ware, R. M., Buffalo, Rochester & Pittsburgh, stated that he had used the Weber joint for the past three years. Last May he put 900 pairs under 70-lb. rails, which had been in service eight years, and they have given excellent results.

The paper by Mr. H. W. Church, L. S. & M. S., on the "Best Method of Directing and Supervising the Work of Section Foremen," was then read. There was very little discussion.

The third session opened at 3 p. m. Wednesday. The report of the committee on "Is it More Economical to Put in Ties out of a Face or in Patches?" F. R. Coates, R. M., N. Y., N. H. & H., Chairman, was read and, after a short discussion, the conclusions reached in the report were adopted.

Thursday morning's session was called to order at 9.30 o'clock. The report of the committee on "Latest Improvement in Frogs and Switches," W. J. Prindle, Pennsylvania Co., Chairman, was read. In the discussion that followed the members seemed about equally divided on the question of what they considered the best pattern of frog. A vote was finally taken on three patterns, and the result was in favor of the rigid bolted frog. The discussion was finally closed to be taken up at the next annual meeting as unfinished business.

A committee, consisting of J. A. Dodson, G. R. M., S. Ry.; H. B. Dick, C. E., Z. & O. R., and George E. Hayward, A. E., C., L. & W., were appointed to amend the constitution of the association.

The meeting adjourned after receiving the report of the Committee on Resolutions and deciding on Denver, Col., as the place for the next meeting.

Test of a Cahall Boiler.

Mr. George H. Barrus, Consulting Engineer, Boston, recently conducted a test of one of the 200-H. P. Cahall water tube boilers at the Narragansett Mills, Fall River, Mass.

The following is taken from Mr. Barrus' report of this test, dated Aug. 9; as will be seen, the results are exceptionally good.

The boiler is one of the regular 200-H. P. Cahall water tube boilers set with an ordinary furnace and plain grates. The boiler contains 108 tubes, 4 in. outside diameter and 18 ft. in length, The diameter of the upper drum is 6 ft. 8 in., and that of the internal flue 34 in. The grate is 8 ft. wide and 5 ft. long, with ½ in. bars and ⅝ in. air spaces. The area of the grate surface is 40 sq.ft., and of the water-heating surface 2,064 sq.ft., the ratio of the two being 1 to 51.6. There are 50 sq. ft. of superheating surface at the average water line. The draft area through the flue is 6.3 sq. ft. or a trifle less than one-sixth of the grate surface, and the space between the tubes for draft area at the entrance is about twice this quantity. The boiler is connected to the main flue of the general boiler plant by means of a rectangular branch 22 × 34 in., which drops about 6 ft. at the point of entrance. The main flue is provided with a damper which is controlled by an automatic regulator. The branch flue from the boiler is fitted with a hand damper, which is located about 6 ft. from the center line of the boiler. The steam pipe, which is 8 in. in diameter, passes from the top of the boiler, horizontally, for a distance of

about 15 ft., and then drops into the main steam pipe, which connects with the engine and the general service of the mill.

For the test the boiler was supplied with feed water by a small steam pump, and the feed pipe was entirely disconnected from all other pipes. The water was fed cold. For the purposes of the test it was drawn through a set of weighing tanks.

The test was of 10 hours' duration, being started at 7:15 o'clock in the morning and ending at 5:15 p. m. The boiler was run continuously during this period, and the test was made with a running start and finish. The difference in the condition and thickness of the fire at the beginning and end was estimated and allowed for. There was one cleaning of the fire during the test, and this occurred about 1½ hours before its close. The firing was done by an expert fireman familiar with the operation of the boiler. The draft was regulated by the automatic damper in the usual way, but when the rate of evaporation was too great the hand damper was partially closed. The spread system of firing was employed, and, as a rule, three shovels of coal were supplied to one door at a time. The hoe was used from time to time, for leveling off the surface of the fire, and at rare intervals the slice-bar was introduced and the bed of coal loosened from the bottom.

The data obtained on the test embraced the coal, ash and water weights, and the various pressures and temperatures usually observed; and, in addition, calorimeter tests of the coal, and frequent analyses of the flue gases, using the Orsat apparatus. The temperature of the steam was taken at a point where the 8-in. pipe drops into the main above referred to. The intervening surfaces, with the exception of the flanges, are covered with magnesia. The temperature was compared with the normal temperature corresponding to the average reading of the gage, the normal being determined at night after the fire had become cool and the superheat had disappeared. The temperature of the flue gases was obtained at a point about 5 ft. from the center line of the boiler, and near the same point the samples of gas were drawn for the analyses.

The coal was Pocahontas, with 3.3 per cent. moisture. The weather being rainy and the coal exposed, most of that used for the test was taken from a point in the coal pile which was made up largely of lumps. The heat test of the coal was made with the writer's oxygen calorimeter.

Of the tables, table No. 1 gives the general data and evaporative results, and tables No. 2 to 4 give the averages of the gas analyses and the data and results relating to the heat balance, which is based thereon.

TABLE NO. 1.—DATA AND RESULTS OF EVAPORATIVE TEST.

Total Quantities.

Duration	10 hours
Weight of dry coal consumed	6,507 lbs.
Weight of ashes and clinkers	391 lbs.
Percentage of ashes and clinkers	6 per cent.
Weight of water fed to boiler	61,722 lbs.
Weight of water evaporated (corrected for superheating)	64,877 lbs.

Hourly Quantities.

Coal consumed per hour	650.7 lbs.
Coal per square foot of grate, per hour	16.3 lbs.
Water evaporated per hour (corrected for superheating)	6,487.7 lbs.
Equiv. evaporation per hour, feed 100 deg., pressure 70 lbs.	6,701.8 lbs.
Horse-power developed, A. S. M. E., basis of 30 lbs.	223.4 H. P.
Equiv. evaporation per square foot heating surface per hour	3.2 lbs.

Averages of Observations, Etc.

Average boiler pressure	110.7 lbs.
Average temperature of feed water	71.1 deg.
Average temperature of flue gases	619 deg.
Average draught suction	0.14 in.
Number of degrees of superheating	4.4 deg.
Weather and outside temperature	Rain, warm
Total heat of combustion per pound of dry coal	14,529 B. T. U.
Total heat of combustion per pound of combustible	15,457 B. T. U.

Results.

Water evaporated per pound of dry coal, corrected for superheating	9.97 lbs.
Equiv. evaporation per pound of dry coal from and at 212 deg	11.841 lbs.
Equiv. evaporation per pound of combustible from and at 212 deg	12.597 lbs.
Efficiency, based on combustible	78.7 per cent.

TABLE NO. 2.—AVERAGE RESULTS OF GAS ANALYSES EXPRESSED IN PERCENTAGES BY VOLUME.

Carbonic acid (CO_2)	15.1 per cent.
Oxygen (O)	4.0 "
Carbonic oxide (CO)	0.7 "
Nitrogen by difference (N)	80.2 "
	100.0 "

TABLE NO. 3.—DATA FOR HEAT BALANCE.

(Assumed composition of dry coal carbon, 84 per cent.; hydrogen, 4 per cent.; ash, 6 per cent.; oxygen, 4 per cent.; sulphur and nitrogen, 2 per cent. = 100 per cent.)

Carbon in combustible	89.4 per cent.
Hydrogen in combustible	4.3 "
Moisture referred to combustible	3.5 "
Carbonic oxide referred to combustible, $\frac{.7}{15.1+.7} \times 89.4 =$	4
Hot gas, not including moisture, per pound of carbon	16.1 lbs.
Hot gas, not including moisture, per pound combustible, 16.1 × .894 =	14.4 lbs.
Temperature of flue gases above that of air, 619 deg. — 90 deg. =	529 deg.
Heat of combustion in one pound of moisture in the gases	1,283 B. T. U.

TABLE NO. 4.—HEAT BALANCE.

Total heat of combustion per pound of combustible by oxygen calorimeter ..... 15,457 B. T. U.

	B. T. U.	P. c.
Heat observed in useful evaporation, 12.597 × 966 =	12,158	78.7
Loss by hot gas, 14.4 × 529 × .24 =	1,825	11.8
Loss by evaporation of moisture in coal and moisture formed by burning of hydrogen (.043 × 9 + .035) × 1,283 =	541	3.5
Loss by unconsumed CO, .04 × 10,150 =	406	2.6
Radiation, carbon in smoke, hydro-carbons and unaccounted for	517	3.4
	15,457	100.0

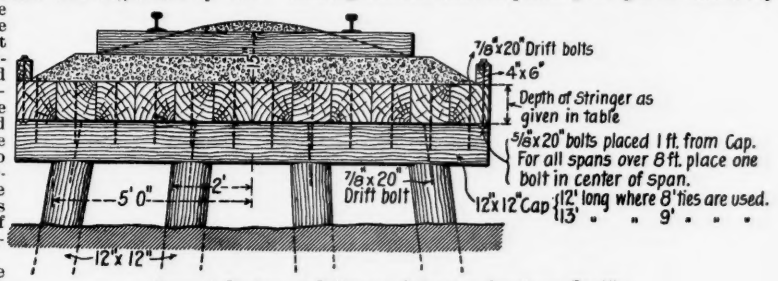
Results.

The power developed the test was 223.4 H. P., or about 10 per cent. above the rated capacity of 200 H. P. This was obtained with an average draft of .14 of an inch water pressure, which is far below the maximum available draft.

The evaporative result was 11.841 lbs. of water from and at 212 deg. per pound of dry coal. This exceeds the guarantee of the boilers (10.5 lbs. of water from and at 212 deg. per pound of dry coal) 12 8 per cent.

The heat utilized by the boiler was 78.7 per cent. of the total heat of combustion of the coal. Of the remaining 21.3 per cent., the gas analyses accounted for 11.8 per cent due to the loss from the waste heat, and 2.6 per cent., due to the unconsumed carbonic oxide, all of which is detailed in the table of the "heat balance." The evaporative result is unusually high for a boiler in which the flue gases escaped at the high temperature which was found in this case, but this is not inconsistent, considering the fact that the quantity of gas is unusually small, good combustion having been obtained with a very small amount of excess air.

The boiler steamed freely during the entire run without undue exertion on the part of the fireman, and there was an entire absence of fluctuation in the water line as revealed in the gage glass. The steam was slightly superheated at a point in the pipe a considerable distance from the boiler.


7/8"x20" Drift bolts
4"x6"
Depth of Stringer as given in table
5/8"x20" bolts placed 1 ft. from Cap. For all spans over 8 ft. place one bolt in center of span.
12"x12" Cap
12' long where 8' ties are used.
13' " " 9' " " "
7/8"x20" Drift bolt
5' 0"
2'
12"x12"

General Design of Ballasted Culverts—Southern Pacific.

Ballasted Floors for Short Spans.

In the last annual report of the Southen Pacific Company special mention is made of the excellent results got from the use of ballasted floors for culverts and short span trestles. The engraving herewith shows the standard ballasted floor. The Southern Pacific has now nearly 60,000 lin. ft. of trestles built substantially on this design, and they have been found eminently satisfactory. The points that may be enumerated as especially valuable are the shallow floor; protection from fire from above; safety in case of derailment; ease with which track repairs can be made by the section forces who maintain the track in perfect surface over the structures without the assistance of the carpenter gangs.

The depth of stringers varies with the span as below:

Clear span	4 ft.	6 ft.	8 ft.	10 ft.	12 ft.	13 ft.	14 ft.
Depth	6 in.	7 in.	8 in.	8 in.	10 in.	12 in.	12 in.

When the culvert consists of one span the maximum length in the clear will be 13 ft.

The piles are so driven that their center lines prolonged will meet at a common point in the vertical through the center of the track about 25 ft. above the top of rail.

The Sargent Company's New Brake Shoe.

The Sargent Company, Chicago, is now putting on the market a new brake shoe known as the "Diamond S," for use especially with steel-tired car wheels. This shoe is constructed in a peculiar manner so as to obtain a more suitable combination of soft steel and cast iron than can be made where the steel is used as inserts.

Fig. 1.—Expanded Metal.

The steel used is in the form of layers of expanded metal. The expanded metal is made from sheets of soft steel about $\frac{1}{16}$ in. thick and $\frac{13}{16}$ in. wide, carefully pickled. These are cut with the grain and pushed out or expanded into diamond-shaped meshes. The width of the sheet when expanded is about 2½ in. and the length about 13 in., while the flat surface of the cut strand is at an angle of 45 deg. with the original plane. A bundle of expanded metal sheets, shown in Fig. 1, is placed in the brake-shoe mold. When the mold is poured the cast iron forms the body of the shoe and unites closely with the steel strands, making a solid casting.

Fig. 2 shows a cross-section of a "Diamond S" brake shoe, the cut surface being etched, and it should be noted that the steel strands are all at an angle to the face of the shoe. While this is due to the peculiar construction of the expanded metal, it is of advantage in presenting a constantly changing wearing surface, and it is doubtless on this account that this brake shoe differs from other metal shoes in the effect upon the wheel-tread. The "Diamond S" shoe gives a uniform wear over the entire tread of the wheel and does not cut grooves in the tire.

The face of this shoe is shown by Fig. 3, and consists of a network of soft steel which prevents the granules of cast iron from being removed by the revolving wheel until the steel barriers are slightly worn down; then the granules are carried along to the next steel strand, and so on to the end of the shoe. In this way the cast-iron granules must pass over many of the steel obstructions before reaching the end of the shoe. It is thought to be due to this action that greater durability and friction are obtained where so large a percentage of the surface is cast iron. We are advised that this action was first noticed while testing a miniature Congdon shoe, having five inserts of wrought iron, during the laboratory tests for the M. C. B. Association in 1889. It was observed that an accumulation of cast-iron granules was formed on the upper edge of each of the wrought-iron inserts. These granules caused the surrounding iron to heat to redness, until finally they passed over the surface of the wrought iron and the heat subsided, until another accumulation of cast-iron granules had been formed.

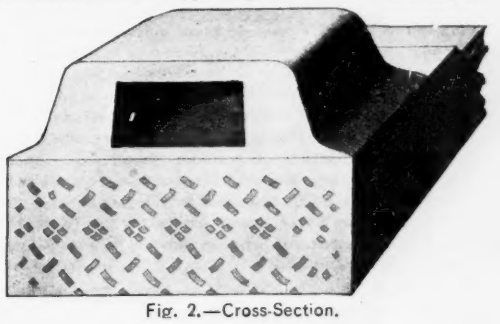


Fig. 2.—Cross-Section.

The trials and tests which have been made with this shoe go to show that the mean co-efficient of friction is about midway between that given by soft cast iron and soft steel. On account of the small obstructions formed by the steel strands the rapid disintegration of the cast iron is prevented and each granule of cast iron performs braking service for a much longer period than in the plain cast-iron shoe. It has been found that the "Diamond S" shoe possesses wearing qualities equal to chilled iron, while giving at the same time a higher mean co-efficient of friction than that metal. On account of the methods and materials used in the manufacture, the new brake shoes are uniform and give as nearly as practicable uniform results. This is not the case with ordinary cast-iron shoes where the hardness of the material varies greatly.

Fig 3.

One of the important points gained by the new construction is that the steel strands strengthen the body of the shoe. This is so evident that it is necessary only to call attention to it and to add that the strength of brake shoes, in many designs, has not been sufficiently considered. Metal introduced in the form of inserts weakens the shoe, but the small steel strands add greatly to the strength.

In many cases where the new shoes have been used it has been shown that, taking into consideration the first cost and the amount of service given, the use of the "Diamond S" shoe was accompanied by a very considerable saving over ordinary cast-iron shoes.

Erie Track Elevation in Jersey City.

Work has been begun in Jersey City preparatory to the elevation of the Erie Railroad tracks at that place. The plans for this improvement were fully described in our issues of Jan 29 and April 23 of this year. Under the contract between the city and the railroad company this work must be begun by Nov. 1. Specifications are now being made, and bids will be asked pretty soon. The present preparatory work consists of removing some side tracks, building new local freight stations and transferring the coaling station and other structures from the north to the south side of the main tracks.

New York State Canal Work.

Superintendent of Public Works George W. Aldridge has advertised for bids, to be received at his office in Albany, N. Y., until Friday, Oct. 1 next, for the following canal improvement work: For providing means of drainage of land in the town of Wheatfield, Niagara County; by deepening and improving Cayuga Creek and its tributaries; for cleaning Cazenovia Lake outlet and rebuilding and repairing the structures thereon; for towing path swing bridge at Higginsville, N. Y. Plans and specifications are now on view at the office of the Superintendent of Public Works in Albany, N. Y., also at the office of Thomas Wheeler, Assistant Superintendent of Public Works, Syracuse, N. Y., and at the office of R. G. Lay, Assistant Superintendent of Public Works, Rochester, N. Y.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

As prosperity returns and earnings become larger, perhaps positively large, many railroads are exposed to a danger which the operating officers often feel acutely. This is the pressure for the resumption of or an increase in dividends, when there is a crying need for a larger expenditure on the road and its rolling stock. During the past four lean years most roads have practiced the severest economy, and a vast amount of work that needed to be done has been postponed, from an absolute lack of means to pay for it. Now the requisitions will begin to pour in, and it is of the first importance that they should be filled. Some of them must be, or the increase in traffic cannot be handled. The cars out of repair that have been standing on side tracks because not needed must be made fit for service, and the locomotive stock made efficient, for the traffic will go to the road that can carry it; but there are many other expenditures that may possibly be still further postponed, and the grand army of speculators, who are hoping to make 20 or 30 or 40 per cent. on shares by the advance in price caused by better prospects confirmed by larger dividends, exercise all the influence they can to obtain an early increase in dividends, with no regard to the permanent interests of the road. Directors of railroad companies have no duty whatever to assist speculators to make money in this way. They should regard the interests of shareholders as if they were permanent holders, and as much interested in the prosperity of the property in 1900 as in the last quarter of 1897. The very best sign for most railroad companies in these days will be a large increase in expenses. Very many of them have a great deal to make good, and their own permanent interests as well as their duty to the public they serve requires that they should promptly put themselves in order to carry safely and economically the increase in traffic which has come or is coming.

The paper on Electric Traction published in this issue gives valuable information on the present status of electricity as a motive power on an elevated railroad. Authoritative information, such as is given by Mr. Gerry, is sought for eagerly by those contemplating a change of motive power on short lines now worked by electricity. Valuable as the paper is, the author modestly asserts in a personal letter that he considers it merely a series of notes containing some definite information for special cases. He raises many points that will bear close inspection, and some time it may be possible to make a comparison of the results here published with those previously given for steam railroads working under practically the same conditions. We call attention to but one of the points discussed. In the diagram, Fig. 2, is shown the variation of train resistance for given speeds, and the conditions under which this curve was obtained were about as follows: The temperature of the air was from 50 to 90 deg. Fahr.; the axles were lubricated with oil; the brake shoes were carefully adjusted and clear of the wheels; very light side and head winds were present, and the track was clean and everything was in first-class condition. The method employed for obtaining this curve was original with Mr. Gerry. Instead of taking the data by a traction dynamometer, he got the tractive effort directly from the current reading on the motor. Having obtained a good current curve, and knowing the fixed relations between current and tractive effort, which always hold for a given motor and gearing, it is possible to get very accurately a traction diagram. The curve C represents the average results thus obtained from about 50 tests, and is for speeds between 6 and 34 miles an hour. It is practically a straight line its equation being $R = 2 + 0.19\ V$. This formula was not introduced in the paper for the reason that a formula might imply a more general statement than was intended by the author. It may be well to state that the results obtained will not justify anyone in recommending another formula for tractive effort. The different formulas now in use have been frequently discussed in our columns, and in our issue of May 21 last the matter received considerable attention. A comparison of the curve given by Mr. Gerry with the most accepted recent curves shows little difference from six miles an hour up to the speed recorded on the Metropolitan Elevated, and all of them are practically straight lines within these limits.

A Contribution to the Theory of Brake Shoes.

In our issue of August 27 we pointed out certain improvements in brake shoe materials, made within the last two or three years, which promise to become of practical value. Intentionally we confined ourselves to statements concerning composition shoes based upon information at hand and believed to be reliable. A correspondent in this issue brings up questions which must have occurred to many who have made a study of the subject of the friction between dry metal surfaces.

In that communication attention is called to the fact that the mean co-efficient of friction obtained with a smooth wheel surface in contact with the smooth face of a composition shoe is higher than that given by soft cast iron. It is true, also, that the idea prevails that rough surfaces give greater friction than smooth ones.

It was found while making the M. C. B. laboratory tests of brake shoes that the conditions of the two surfaces in contact had an important effect on the mean co-efficient of friction. Briefly stated, much higher mean co-efficients of friction were got by using either two rough surfaces or two smooth surfaces in contact, than by using a smooth and a rough surface togother. Also, plastic materials, as in the Kinzer brake shoe, gave higher mean co-efficients of friction than did any of the plain metal shoes. The metal shoes roughened the test wheel to a greater or less degree, while the composition of the Kinzer shoe produced a smooth surface on the face of the wheel.

These effects have best been explained by assuming the surfaces of the shoe and wheel to be made up of small projections, and also taking into account the physical characteristics of the materials used in each case.

The soft cast-iron brake shoe tends to produce a rough surface on either chilled or steel-tired wheels. The surface of the shoe is also rough, being made up of comparatively large, brittle projections. That such surfaces when in contact shall pass each other the projections must either be broken off or they must ride over each other. In the former case work is done by breaking the material, while in the latter case work is done against the normal pressure on the brake shoe. It is evident that the larger the projections the smaller will be the number in contact in a given area. If, combined with comparatively large projections, the material is brittle, the greater tendency will be for the points to be broken off, which is the case with soft cast-iron brake shoes. The friction in this case depends largely upon the resistance of the material to breaking and the number of projections brought together. If the soft cast-iron surface is used in connection with a smooth surface made up of many very small projections, there would be a less complete interlocking of the particles, a reduction in the amount of material broken off, and a lower mean co-efficient of friction would result. This point has been demonstrated by the M. C. B. tests, as will be shown later.

In the case of the soft composition brake shoe we have the condition of two similar, smooth surfaces in contact. It has previously been stated that the composition so fills up the irregularities in the wheel surface as to form on the wheel practically a coating of composition. The projections on the two surfaces in this case are similar and extremely small, but for this reason their number is increased correspondingly. On account of the plastic nature of the material the greater tendency is for the particles to ride one above the other rather than to be broken off. The high mean co-efficient of friction obtained is accounted for by the increased number of points in contact. It is not reasonable to assume, however, that with the composition shoe there is no breaking off of the particles of the material, as in any case this action will take place to a greater or less degree.

If the theory advanced is accepted it is evident why it is possible to obtain from the composition shoe a greater service than from soft cast iron, for the same amount of wear, which is our correspondent's second question. Also, the point which was brought out clearly by the M. C. B. laboratory tests is explained by this theory. To obtain the maximum mean co-efficients of friction the surfaces in contact should be similar; namely, two rough surfaces or two smooth surfaces together will give higher co-efficients of friction than a smooth surface and a rough surface. Whether any two rough surfaces will give a higher co-efficient of friction than two smooth surfaces is a question which can only be determined by trial.

Considerable work was done, during the M. C. B. laboratory tests especially, to show that a rough and a smooth surface in contact gave a much lower co-efficient of friction than did the same materials where the surfaces were both smooth. The soft cast-iron brake shoes roughened the surface of the chilled test wheel, while the soft steel shoe after a sufficient number of applications of the brakes gave the wheel a very smooth surface. It was thus possible to get marked differences in the condition of the wheel surface with other factors remaining constant.

A number of stops were made in this way using the soft steel shoe. It was found that when stopping from speeds of 65 miles an hour, with a braking pressure of 2,798 pounds, the mean co-efficient of friction could be made to vary from about 12 to 19.5 per cent.; when stopping from 40 miles an hour, with the same shoe and braking pressure, the mean co-efficient could be varied from about 12 to 28.4 per cent., while similar stops from 30 miles an hour gave the corresponding results of 12.3 to 27.8 per cent. These differences were obtained with the lowest braking pressure tried, and it was further found that as the braking pressure was increased the differences between the mean co-efficients, due to varying the condition of the wheel surface, gradually became less, until at the heaviest braking pressure used, 10,733 pounds, no such effect was noticed.

This would show that the smooth surface of the steel shoe at light braking pressures rode on top of the rough spots on the wheel, and only a few points were in contact when the low results were obtained. With very heavy pressures the rough places were so quickly cut down that the friction was not affected.

We might say further that ordinary cast-iron shoes show a greater tendency to wear by grinding or by the breaking off of the small particles in contact than any of the common metals. This doubtless is because the metal is brittle and does not heat sufficiently to flow, even in heavy service. The soft composition brake shoes represent the opposite extreme where the material is pliable and yet is not seriously affected by heat. Beside these materials, there are used for brake shoes hard and soft steel, wrought iron and malleable iron, the action of which depends largely upon the temperature the shoe attains during the application. Little is known about the relation which exists between the temperature and the co-efficient of friction of these materials. It has been observed in a general way that the coefficient of friction appears to decrease as the temperature increases, especially for steel and wrought iron. These become heated and flow under the conditions found in heavy service.

The points here brought out may be said to have scientific interest rather than practical value. The conditions in actual service are too variable to warrant going into any considerable refinements. It is possible, however, that a careful investigation of the effect of temperature on the co-efficient of friction might be valuable and suggest possible improvements.

On the other hand, the last question of our correspondent is a thoroughly practical one and is about the first which is likely to occur to a car man. If soft composition brake shoes cannot be used in place of cast-iron without changing the brake leverage of the car, the chance of their becoming a commercial success is small.

The soft cast-iron brake shoe was selected by the M. C. B. committee as the standard for comparison, as it gave higher co-efficients of friction than the other metal shoes tested and because cast-iron is more generally used for brake shoes than any other material.

The following table, compiled from the Committee's report of 1896 (Proceedings M. C. B. Association, Vol. 30), gives the average results of the shop tests using soft cast-iron and composition brake shoes under similar conditions of speed and braking pressure:

AVERAGE RESULTS OF TESTS ON CHILLED TEST WHEEL.

Braking pressure, lbs.	Speed, miles per hour.	Mean co-efficient of friction		Co-efficient of friction near beginning of stop.		Co-efficient of friction 15 ft. from end of stop.	
		Composition shoe.	Soft cast iron shoe.	Composition shoe.	Soft cast-iron shoe.	Composition shoe.	Soft cast-iron shoe.
10,733	65	18.7	15.3	21 1	15.4	27.7	22.3
6,750	65	25 0	21 0	26.4	20.3	34.3	30.5
6,750	40	29 6	28.4	36.1	....	35.4	35.8
4,000	40	34.7	28 2	36.2	24.5	38.5	33.7
2,798	40	34.0	34.6	31 1	35.0	41.8	43 9

NOTE.—Where more than one complete set of tests is shown in the report, those tests giving the highest results have been selected.

It will be noted that the mean co-efficients of friction of the composition shoes are higher than those of the soft cast-iron, excepting where the lightest braking pressure was used, stopping from 40 miles an hour; in this case the results are practically the same. The same statement is true for the co-efficients of friction near the beginning of the stop, excepting the cast-iron shoes, at the lowest braking pressure and an initial speed of 40 miles an hour, gave a higher value than the composition. The co-efficients of friction of the composition shoes, measured fifteen feet from the end of the stop, under most conditions are slightly higher than those of cast-iron.

The maximum co-efficients are obtained near the end of the stop after speed has been greatly reduced, and it is at this point that the danger from skidding the wheels arises. These maximum co-efficients of friction govern the design of the brake rigging. It does not appear from the table that there is enough difference between the maximum co-efficients of the two kinds of shoes to expect that the composition brake shoes would skid the wheels if used in place of soft cast-iron shoes.

It was apparent from the diagrams taken from metal brake shoes at the time of the M. C. B. shop tests that the stresses set up in the pull rods connecting the shoe with the dynamometer were intermittent and continually varied in intensity, reaching a maximum just before the end of the stop. It seems but reasonable to conclude that this irregular action of metal brake shoes must have a direct tendency to start the skidding of the wheels. On this account there seems to be reason for the belief that because of the smooth stops and uniform action of the soft composition brake shoes, higher maximum co-efficients of friction than are allowable with plain metal shoes can be used without danger of skidding.

Annual Reports.

The New York Central.—The New York Central & Hudson River Railroad in its last fiscal year had a traffic equivalent to the movement of 398 passengers and 2,168 tons of freight daily over the entire 2,395 miles of road which it works. The average New Yorker who sees an almost uninterrupted series of trains leaving and arriving at the Grand Central Station would doubtless be astonished to learn that the average passenger train movement on this system is equivalent only to 8.28 trains daily in each direction. And this is a little greater than the freight train movement, which was equal to 7.87 trains each way daily, though this is one of the greatest freight railroads in the world. The very heavy movement, however, is confined chiefly to the 442 miles between New York and Buffalo and the 75 miles between Rochester and Niagara Falls, and if we had the figures for these separately we should find a very much greater density of traffic than is indicated by the figures above.

There are nearly 5½ ton-miles on the road to every passenger mile, though its passenger traffic is equaled by very few lines in America. The number of through passengers is given as 203,093—that is, an average of 278 each way daily, who could be comfortably seated on one train. This also will probably astonish the "average" man, and perhaps some who know more than the average man about railroad traffic. If these "through" passengers include only those going the whole distance between New York and Buffalo or Suspension Bridge excluding the heavy New England travel between Albany and the western termini, they formed 90 millions of the total 690 million passenger miles, so that the local passenger movement was nearly seven times as great as the through. The proportion of through passenger *journeys* was only one out of 114, the average passenger journey being a little less than 30 miles.

The through freight movement east and south was more than six times as great as the through movement in the other direction. The disproportion was unusually great, and due chiefly to "hard times," purchases of merchandise being unusually small in a year when the crop movement was decidedly heavy. The eastbound movement last year was 15 per cent. greater than the year before, while the westbound movement was eight per cent. less. Roughly speaking, farm produce and lumber make up the traffic to New York, and merchandise the movement from it.

The movement of way freight is also much greater eastward than westward—last year 85 per cent greater. The local freight counted in *tons* (not ton-miles) was 9½ per cent. *less* in 1897 than in 1896, though the through freight increased 11 per cent., and the way freight movement declined in both directions—the westbound 11 per cent. and the eastbound 8½ per cent.

The statistics of the different kinds of freight moved show that coal and coke were about one-fourth of the whole, yet one-fifth less than the year before, and this accounts for nearly two-thirds of the total decrease in local freight.

The through freight is comparatively much more important than the through passenger traffic. Although there were more than five tons of way freight to one of through, yet the through freight (if the Albany-Buffalo traffic is not included) made up 1,466 out of the total 3,790 million ton-miles, which is nearly 39 per cent. of the whole. It is of course a much larger proportion of the movement over the 517 miles to which the through movement is chiefly confined.

The general results of operation were as below:

	1897.	1896.	Inc. or Dec.
Gross earn	$44,280,139	$45,144,967	D. $864,828
Oper. expen.....	29,648,147	30,455,570	D. 807,424
Expen. to earn.....	(66.96%)	(67.46%)	
Net earn....	$14 631,993	$14,689.397	D. $57,404
First charges...	10,580,125	10,645,604	D. 65,478
Profit.....	$4,051,867	$4,043,793	I. $8,074
Dividend....	4,000,000	4,000,000	
Surplus.....	$51,867	$43,793	I. $8,074

It will be observed that the working expenses fell off nearly as much as the gross earnings, and therefore the decline in net was very small, less in fact than the decrease in interest charges, so that after paying the same dividend as the year before there is a slightly greater surplus.

Of the falling off in earnings (about $865,000 total) over $610,000 was from passenger earnings, while the freight earnings decreased only $134,000; that is, the decrease in passenger earnings was 4½ per cent., while the decrease in freight earnings was only about ⅓ of 1 per cent. The freight earnings amounted to $25,851,000, and the passenger earnings $13,095,000. The passenger-mile earnings were slightly greater than the year before; that is, the rate was 1.9 cents last year and 1.89 the year before. The falling off in earnings is due therefore to the loss of business. The total passenger miles in 1897 were 689,765,000, and the decline from the preceding year was 34,463,000, or 4.8 per cent. The freight rate was slightly greater than in the preceding year, namely, 0.68 cent as compared with 0.67. The total of tons carried was a little more than 23 millions in 1897, as against 24⅛ millions in 1896. The ton-miles amounted in the last year to 4,070 millions, the year before to 4,102 millions. Of all the items of freight traffic there was an increased tonnage only in grain and other agricultural products.

The economies in operating expenses were great. Maintenance of way and structures was cut down $489,429, being over nine per cent. Maintenance of equipment was cut down $203,545, or 4⅛ per cent. Traffic expenses were reduced $451,004, or 2⅛ per cent. The general expenses increased slightly and taxes were increased $318,129, or over 18 per cent.

New York, Ontario & Western.—The annual report for the fiscal year to June 30, 1897, shows few changes, but the increase of $115,067 (3.05 per cent.) in gross earnings brought the revenue above the highest previous figure. Net earnings are likewise the highest in the company's history. The following table shows the growth in revenue in the last eight years:

	Earnings.	Oper. expen. and taxes.	Net revenue.	Charges.	Surplus
1890.....	$2,200,446	$1,768,042	$432,403	$285,961	$146,441
1891.....	2,809,702	2,155,372	654,330	553,890	100,439
1892.....	3,265,417	2,481,136	804,281	597,262	207,019
1893.....	3 088,173	2,798,225	889,948	633,095	256,852
1894.....	3,842,119	2,732,540	1,109,579	690,012	419,566
1895.....	3,669,113	2,642,412	1,026,700	700,317	326,382
1896.....	3,779,335	2,698,558	1,080,777	705,208	375 569
1897.....	3,894,402	2,780,496	1,113,906	713,995	399,911

The increase in revenue from coal has been the chief element in this, and the building of the Scranton extension in 1890 made possible the expansion of this traffic. Since it was opened the tonnage has grown from 811,485 net tons to 1,653,596—more than double—while the revenue shows an even better improvement, being in 1897 $1,722,936, or 1⅞ times as much as in 1891. The increase in revenues from coal was as a matter of fact larger than the total increase in freight receipts. The company earned $640,718 more from coal this year than in 1890; but including the coal receipts freight earnings are only $693,957 more than in 1890, so that but for the increase in coal traffic the freight receipts would show a material decrease in eight years.

The better coal revenues in 1897 were not due to a larger tonnage—in fact, 20,000 less tons were carried than in 1895—but to better rates received for the coal sold and to a change in the method of distribution. On the 1,204,000 gross tons of commercial coal transported from the Scranton division, $1.276 per ton was received against $1.151 last year. In 1896 the company built four barges to transfer coal from Cornwall, the terminus of the road on the Hudson River, to tidewater and Long Island Sound points, and there has been an increase of two-thirds since 1896 in the tidewater shipments via Cornwall, or 124,000 tons, while Lake coal deliveries via Oswego have declined 66,000 tons.

The milk traffic has had a remarkable development, as is well known, and now gives the company 14.1 per cent. of its total revenue. The earnings in 1897 were $443,000, and in 1893, $347,000. But the decision of the Interstate Commerce Commission in March last changing the practice of the railroads handling this traffic, which had been to charge a uniform rate of 32 cents a can of milk, regardless of distance carried, has had the effect of decreasing shipments from distant districts, though its ultimate effect on the company's revenue is not yet settled. Two items of freight, coal and milk together account for 69 per cent. of the company's earnings.

Atchison, Topeka & Santa Fe.—The annual report for the year ending June 30 is the first issued for the full fiscal year by the reorganized Atchison. The statistics given are, therefore, of especial interest as indicating the earning power of the property in a year, which was quite unfavorable for almost all of the leading Western lines and in which the Atchison reports an increase in gross receipts of over 1½ million dollars, but the comparison is with a year of rather poor earnings.

The amount required for interest charges has been considerably increased during the year, but the company not only earned its full obligatory charges but within $88,000 of the sum needed to pay three per cent. on the adjustment bonds, which do not become a fixed charge until 1900.

The net earnings in 1897 were $7,754,041, and other income raised this total to $8,008,540. Taxes and rentals called for $1,947,237, and interest charges were $4,608,858, leaving a surplus of $1,452,446 on the year's operations. A surplus of $150,781 was carried over from June 30, 1896, so that the total credit was $1,603,227 on June 30, 1897. Out of this the directors declared three per cent. on the adjustment income bonds calling for $1,540,000. All this was accomplished in a year when earnings were not as high as may be reasonably expected and when expenses were large.

The general figures for the two years are as follows:

Earnings:	1897.	1896	Inc. or Dec.
Freight.....	$22,067,686	$ 9,626,993	I. $2,440,693
Passenger.....	5,574,288	6,269.683	D. 695,394
Mail.....	939,495	938.860	I. 635
Express.....	931,052	930,782	I. 270
Miscellaneous...	1,108,706	1,233,278	D. 124,571
Total earn.....	$30,621,230	$28,999,597	I. $1,621,632
Operating Expenses:			
Main. of road & struct..	$6, 82,923	$5,595,837	I. $687,085
" of equip	3,143.881	3,202,085	I. 241,799
Transportat'n & traffic.	12,038,786	12,221,071	D. 184,285
General expen.....	1,103,594	1,052,281	I. 51,312
Total oper. expen.....	$22,867,188	$22,071,275	I. $795,913
Net earn. from oper't'n.	7,754,041	6,928,321	I. 825,719
P. c. of oper. expen. to earn.....	74 68	76.11	D. 1.43

The Atchison is an important corn carrier, and of course it gained heavily in this traffic in the last year. But although Atchison is called a granger road, it is worth while to recall that its coal traffic is usually more than twice as heavy as its grain tonnage; its merchandise freight in 1896 was nearly as large as grain, but in 1897 these proportions were somewhat changed. In 1897, the tonnage of agricultural products was 28.3 per cent. of the total; in the first six months of 1896 only 19.7 per cent. The percentages which other leading items of freight were to the total in 1897 were as follows: Mine products, 32.5 per cent.; animal products, 15.5 per cent.; merchandise, 6.5 per cent.; manufactures, 8.3 per cent. and forest products, 6.6 per cent. There were losses in all these freights except animal products; mine products falling from 37.0 per cent. in 1896.

In 1897 the maintenance charges increased $929,000, or $133,000 more than the net increase in working expenses. The following is a brief summary of the principal items of improvement work in 1897, and the apportionment of the cost between expenses and capital accounts. The total charge to capital in 1897, it should be stated, was $1,458,623.

Class of Work.	Total Cost.	Charged to Operation.	Charged to Construction.
New rails laid—387.91 miles.....	$1,352,354	$1,352,354	
Second-hand rails laid—257.16 miles.....	56,189	56,189	
Ballast—new and renewed—516.35 miles..	431,065	126,782	$304,223
Bridge work.....	591,983	302,669	289,314
Automatic couplers—6,206 cars.....	189,810	141,316	48,494
Capacity of cars increased—502.....	71,642	71,642	
	$2,692,985	$2,050,953	$64 ,032

Over 380 wooden bridges and trestles aggregating 26,587 lin. ft., were replaced by iron or steel spans, arch culverts, iron pipe or solid earth. The total amount expended during the fiscal year for maintenance of road structures and equipment was $9,726,808; being 42.53 per cent. of total operating expenses, being $1,501 per mile of road operated.

It will be worth while to insert here the amounts spent by the Atchison in each year since the Receivers were appointed, for maintaining and renewing equip-

ment and roadway and structures, and such figures are given below:

	1897.	1896.	1895.	1894.
Repairs of roadway and track	$2,295,070	$2,012,920	$1,832,447	$1,694,850
Renewals of rails	553,465	325,679	226,043	55,357
Renewals of ties	966,660	955,929	921,238	775,466
Bridges and culverts	815,838	824,428	718,269	708,001
Total, maintenance of way	$6,282,923	$5,595,837	$4,994,183	$4,424,327
Locomotive repairs and renewals	$1,315,236	$1,315,804	$1,355,816	$1,395,062
Freight car repairs and renewals	1,623,984	1,374,139	1,255,953	1,276,780
Total, maintenance of equipment	$3,443,885	$3,202,085	$2,983,271	$3,085,664

In the last four years, then, the company has paid out of its working expenses $21,300,000 for its roadway and buildings and over $12,700,000 in the same period for its equipment.

The transportation account, where economies in handling traffic are apparent, has been showing constant decreases, while maintenance charges have been growing. In 1894 the charges in this account were $13,906,000; in 1897 they were $1,869,000 less than this, or but $12,037,000. The decrease amounts to 13.4 per cent. Freight car mileage is not published, but the increase is stated to have been 24,254,629 miles, and engine mileage decreased by 8,583 miles, so that the train load must show considerable improvement. This figure, however, is not given in the report. Locomotive expenses decreased $208,585 and the cost of locomotive service per mile run was reduced from 19.05 cents to 18.03 cents.

During the year the company took over the Santa Fe Pacific (the Old Atlantic & Pacific), 819 miles, and the Sonora and New Mexico & Arizona roads were transferred to the Southern Pacific. The Atchison system will thus hereafter comprise 6,935 miles. The report contains a summary to show the 1897 earnings of this mileage which will constitute the basis for future comparisons. The gross revenue was $33,633,640 or $4,850 per mile; the fixed interest charges are $5,024,505 a year, equal to $418,709 a month, or $725 per mile a year. Fixed charges are 14.9 per cent. of the gross earnings, and, including the full four per cent. interest on the adjustment bonds, is 21.09 per cent. of the gross earnings.

The Antofagasta & Bolivia.—It is always a pleasure to make note of the progress of this little railroad, which has crossed the Andes and found its way into the very center of the Bolivian plateau at Oruro. It is no longer new, but it is interesting to recall how quietly it was done, so that the Andes were crossed before the world at large knew that the road was building, and it is equally interesting to observe how unostentatiously it has gone on proving its right to exist, paying its bills and earning money without ever getting into court or making any disturbance in the world. It is a good example of wise pioneer railroading in a difficult country, and it has immensely increased the volume of Bolivian trade and stimulated the entire republic.

The report for the year 1896 announces a net income of $2,584,002 on 574 miles of this 30-in. road, being a gain of $540,519 over the preceding year, and this in spite of unusual expenses on account of maintenance of way, due to reballasting and placing 80,000 sleepers on the Uyuni-Oruro section. The gross income on the Antofagasta-Uyuni section (across the mountains) was $5,232,967, and on the Uyuni-Oruro section $792,903. The latter section was worked at a loss, owing largely to the improvements mentioned on permanent way.

The passenger traffic represents 3.29 per cent. of the whole. The average rate per mile for passengers in 1896 was 6.9 cents. The total freight movement amounted to 426,423 tons of 2,000 lbs., and the average rate was 14½ cents per ton-mile. But the rate from the coast to the plateau is 170.27 per cent. greater than in the reverse direction, which, of course, is due to extra cost. The number of locomotives in service in 1896 was 50, an increase of four over 1895. The total locomotive mileage was 1,214,728 and the miles run per ton of coal were 38.48.

Fitchburg Railroad.—The Fitchburg report for the year ending June 30 shows diminished gross earnings, diminished operating expenses and increased net earnings, a somewhat unusual result. The length of line worked was 458 miles, being the same as last year and the year before. On this mileage the results were:

	1897.	1896.
Gross earnings	$7,155,768	$7,606,765
Operating expenses	4,979,830	5,462,316
Net earnings	$2,175,938	$2,144,449
Interest, taxes and rentals	1,542,640	1,511,722
Balance	$633,299	$632,727

Out of the balance dividends were paid to the amount of $603,754 on the preferred stock, which, by the way, is much the largest part of the stock.

The passenger earnings fell off $176,000, or 7.6 per cent., and the freight earnings fell off $348,000, or 7.7 per cent. The passengers carried were less in number and the passenger miles were less, but the passenger rate was somewhat greater, being, in 1897, $1.81, and in 1896, $1.77.

The freight tons fell off from 4,775,000 to 4,471,000 and the ton-miles declined from 551 millions to 504¾ millions. The length of haul also decreased, but the ton-mile rate was slightly greater, namely, 0.891 cent in 1897 and 0.88 cent in 1896.

The largest saving in operating expenses was in maintenance of equipment, namely, $289,000. The maintenance of way expenses were almost precisely the same in the two years. There was a saving of $161,000 in conducting transportation and $52,000 in general expenses. The freight-train load increased from 162 to 172 tons, which probably accounts in some measure for the saving in conducting transportation.

2,530 tons of rails and 234,667 ties were used in repairs during the year and $108,000 has been appropriated for further immediate purchase and laying of rails and ties. Five new locomotives have been provided for and three of them bought and in service. The company is in a position to build, without calling upon capital account, 246 cars of 60,000 lbs. capacity.

The export business of the past five years has increased from 276,000 tons in 1891 to 769,588 tons in 1896. The Hoosac Tunnel docks have become so occupied by the London and Liverpool business that no other vessels can be accommodated, and the company has acquired another dock property on Commercial street at a cost of $675,000.

At the annual meeting to be held Sept. 29 the stockholders will be requested to authorize the Directors to issue $1,450,000 in bonds, to be used in paying a mort gage of $500,000 on the Hoosac Tunnel dock property due next April, and for refunding $550,000 of six per cent. bonds due next July, and for funding the floating debt.

Observations on Staybolt Breakages.

In the *Journal* of the Society of Austrian Engineers and Architects, Herr Edm. Wehrenfennig has lately presented a paper under the above title. His experience has shown that staybolts break chiefly in the four upper corners of the firebox. At these places, and especially in the two forward corners, each staybolt must be replaced every year or two, while in the lower rows, near the bottom of the firebox, fractures are much less frequent. In some of the lower rows, in contact with the fiercest flames, the bolts have to be renewed chiefly on account of the loosening and burning off of the heads.

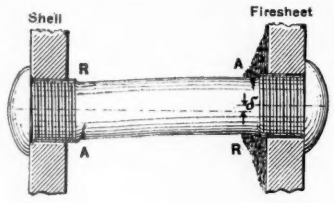


Fig. 1.

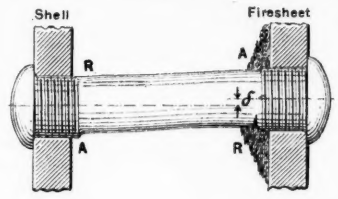


Fig 2.

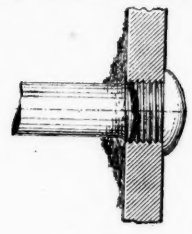


Fig. 3.

When the breakage occurs in the shank of the staybolt, in general, where the inside firebox is of iron, the fracture is found to be near the outside shell; but with a copper firebox, the staybolt breaks next to the fire sheet. When we examine a staybolt that is bent by the relative shifting of the copper firebox shell, and the iron outside sheet, we see that the upper and lower fibers are strained at *A A* by tension, and at *R R* by compression (Figs. 1 and 2). By this strain, the elastic limit of the material of the bolt is finally exceeded, a slight permanent extension of the fibers begins at *A*, and a compression at *R*. When the box is cold and has contracted, the fibers at *A A* begin to be compressed, and at *R R* to be stretched. These strains are repeated at each heating up and cooling off.

As both copper and iron staybolts are used in European locomotive boilers, it is interesting to compare their respective behavior. The tensile strength of iron is higher than its crushing strength, so, since this is true, the iron staybolts would be expected to break in those fibers on the sides under compression, at *R R*. With copper, quite the reverse is the case, as its compressive strength is greater than its tensile strength. Consequently, a copper staybolt usually begins to break on its stretched side. These predictions are quite well fulfilled by the experience of a large number of cases.

With an iron staybolt its fastening in the iron outside sheet is firmer and more secure than in the more yielding copper plate of the firebox, and the fracture usually begins in the shank, on the outside, and proceeds inward toward the firebox. With copper staybolts the fracture would ordinarily be expected to occur at either side with about equal probability, but in the majority of cases it is nearer the firesheet than the outer shell, possibly because the former is at the higher temperature.

Copper loses its tenacity as its temperature is raised and at 186 deg. Cent., the temperature corresponding to 10 atmospheres pressure, this loss amounts to 15 or 20 per cent. As the formation of scale on the sheets is greater just around the staybolts in proportion as the temperature is higher, a fracture is more certain to take place. In fact, in most cases it happens just within the sheet itself, as Fig. 3 shows. It is evidently necessary, therefore, to obtain a better circulation of the water around the firebox, so as to diminish the accumulation of scale on the staybolts and plates. Of course, the constantly increasing scale, itself possessing a very low conductivity for heat, causes increased consumption of coal, increases the danger of broken staybolts (especially copper ones), conceals incipient fractures and causes buckling of the sheets from overheating. Hence good circulation and pure water are prime requisites for the preservation and long life of a boiler.

It is evident, then, that the location of the fractures of staybolts is fairly well determined beforehand, as determined by a careful examination and inspection. In iron staybolts, the breaks can be located by the heat marks; with copper ones, through the sharp, black lines: with both, however, the surest method to detect the fractures is by the removal of the scale.

The author recommends the employment of the more flexible copper staybolts in the upper corners, and iron ones in the intermediate and lower parts of the firebox; and that they be arranged in such a way that the water may deposit the least possible scale on them. He considers it good practice to drill out copper staybolts on both ends, while for iron stays, drilling at the outer end only should be sufficient.

Electric Traction on the Metropolitan Elevated, Chicago.*

BY M. H. GERRY, JR.†

In the following paper will be found a brief discussion of some of the more important problems arising in connection with the application of electric motive power to the heavier classes of railroad service. A number of tests and diagrams from the Metropolitan Elevated Railroad of Chicago are introduced by way of illustration.

A part of this paper relates especially to the application of electric power to passenger rapid transit on elevated and suburban roads. The conditions for this service differ somewhat from common railroad practice. Regular stops are made at frequent intervals; the distance between stations on elevated roads, for example, averaging about 2,000 ft. The interval between trains is small, and the time of stops very short. The traffic is irregular, is heavy at certain hours, and is apt to increase and decrease at a rapid rate. To make the fast running time desired, the speed must increase up to the point where the brakes are applied; thus the maximum of speed is high compared with the mean speed. There is little or no opportunity for maintaining the speed, and the running time depends almost entirely upon the rate of accelerating and retarding of the train.

With a given number of stops per mile, the amount of power required will increase very rapidly with the speed beyond a certain point, and the cost per car mile will not furnish a reliable basis of comparison for the motive power of different roads unless the conditions are the same. A slight difference in the average speed or in distance between stations may cause a considerable change in the amount of power required.

Certain operating conditions have a special bearing on the efficiency of this form of motive power; the most important being the frequency of the train service. If traffic is such that a large number of trains must be operated on a division, the electric power will have an advantage, in point of economy, over steam locomotives; and if the trains are few, the reverse will be the case. This condition holds good independently of the weight of the trains or of the speed attained. The length of the line is in itself no bar to the successful operation of an electric railroad, as, by using alternating current apparatus, the power stations may be located favorably and at long distances apart.

The distribution of the current to the trains, while it presents many practical difficulties in detail, is not so serious a problem as it was thought to be at one time. Of the three systems of overhead conductor, conduit and third rail, the last has given the best results, and is advisable wherever the conditions are such that it can be installed. For roads operating on their own right of way, there is really no serious objection to the third rail, and all of the difficulties encountered at crossings, switches and in yards can be overcome by methods already in use on the roads named above, or by other devices that have been proposed. It is not to be expected that all details of such a system are in an entirely satisfactory and final form, but they are practically operative at present and being constantly improved as difficulties develop in service. The experience already gained also justifies the statement that a reliable overhead or conduit system for heavy service can be constructed if the conditions favor the use of such methods.

The Metropolitan Elevated Railroad, now in its second year of operation, is the largest road in existence employing exclusively electric power for a heavy passenger service. The structure has four tracks, from Market street west to Marshfield avenue, at which point three double-track lines diverge. The northerly branch divides again near Robey street into two double-track branches. From Market street to each of the terminals the distance is about six miles. (See map, Fig. 1.)‡

The motor cars measure 47 ft. in length and weigh about 62,000 lbs. when loaded to their maximum capacity. They are mounted on rigid bolster locomotive type trucks, having 33-in. steel-tired wheels. The truck centers are 33 ft. 6 in. apart and the truck wheel base 5 ft. 6 in. One truck of each motor car is equipped

* Abstract of a paper presented at the 14th general meeting of the American Institute of Electrical Engineers, Eliot, Me., July 26-28, 1897.

† Supt. Motive Power Metropolitan West Side Elevated Railroad, Chicago, Ill.

‡ For description of cars on Metropolitan Elevated see *Railroad Gazette*, Feb. 1, 1895; for information regarding generators and contact device see issue June 7, 1895; for distances between stations, grades, etc., see issue Aug. 9, 1895, and for general particulars of electrical equipment refer to issue of Feb. 15, 1897.

with two motors, each nominally rated at 2,000 lbs. drawbar pull. The motors are operated by series parallel controllers, situated in the cabs at each end of the car. Rheostats of the packed ribbon type, used in connection with the controllers, are placed underneath the car. A circuit breaker placed in each cab is used both as a safety device and as a main switch for opening the circuit between the trolley device and the controller. A main fuse box is also provided and placed in one of the cabs as an additional safety device, but experience has shown that failures of the circuit breaker to act are so rare that the former piece of apparatus might well be omitted. Circuit breakers have proven very satisfactory for this service, as they cost little for maintenance, are

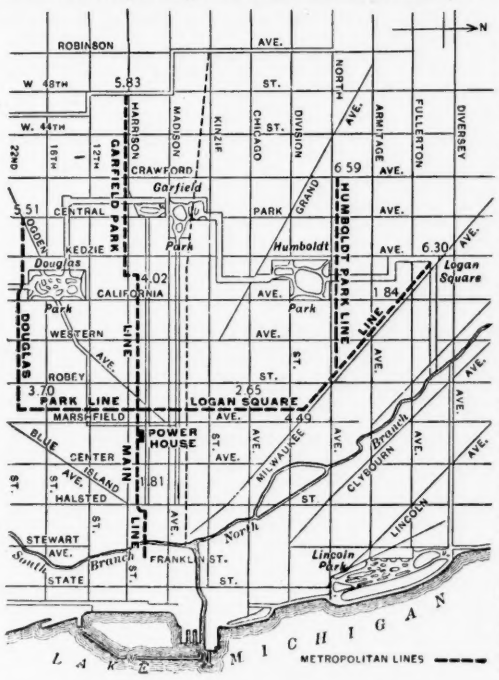


Fig. 1.—Lines of the Metropolitan Elevated Railroad, Chicago.

reliable as safety devices and by their quick action reduce to a minimum the damage to apparatus from grounding and short-circuiting.

The cars are warmed by electric heaters arranged in three circuits, two of which take about seven amperes each, and the remaining circuit about four amperes All of the heaters are required only in the coldest weather, and are turned on and off by the trainmen. By cutting out all or part of the heaters for a short time when the traffic is heaviest, the peak of the load can be reduced and the heaters used to improve the load factor.

The air brakes are of the direct or "straight" type, with an additional reinforce cylinder.

The Power Absorbed by Trains.

In an electric railroad the mechanical energy supplied at the engine shaft may be divided, for purposes of discussion, into two general classes. First, that finally absorbed or utilized in propelling the train, and, secondly, the energy lost in transformation and transmission, including losses in generators, line, rheostats and motors.

The first division or class may be divided again into three parts: First, the energy required to accelerate the train to its maximum speed after each stop. Secondly, the energy required on account of ascending grades. Thirdly, that required to overcome train resistance, including friction, air resistance, etc. If the stations are far apart the energy required to accelerate the train may be neglected without serious error, but for a service where trains make frequent stops and the maximum speed is high compared with the mean speed, it becomes of importance and may easily be the greatest of all losses. The amount of energy required for train acceleration obviously depends upon the number of stops, the

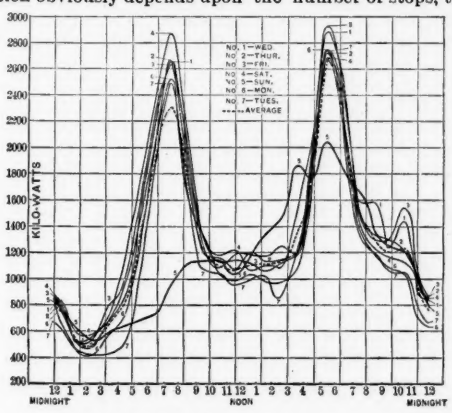


Fig. 9.—Load Curves.

train weight and the maximum speed. Knowing these quantities, it can be readily determined from the common mechanical formula for kinetic energy:

$$U = \tfrac{1}{2} M V^2 = \frac{W}{2 \times 32.2} \times V^2 = \frac{W V^2}{64.4}$$

The horizontal effort or drawbar pull required to produce a certain acceleration in a given time may be obtained from the mechanical formula, $f = \frac{w v}{32.2 t}$. *

The work done in ascending grades is the product of the train weight and the vertical distance the train is lifted. The horizontal effort required to take a train up a grade is equal to the product of the train weight by the per cent. of grade.

Train resistance, as used in this paper, includes all retarding forces other than those due to inertia and grades. Formulas for determining this quantity are empirical and are based upon experimental results, where the conditions have varied widely. D. K. Clark, in "Railway Machinery," recommends a formula which reduced to tons of 2,000 lbs., becomes $R = 7.1 + \frac{v^2}{192}$. Another formula in use is $R = 4 + \frac{v^2}{200}$, where R = resistance in pounds per ton of train weight, v = speed in miles per hour. These two formulas have been plotted in Fig. 2, and are marked respectively A and B*. From measurements taken on the Metropolitan Elevated, the curve C has been determined and is used in the following discussions.

In Figs. 3 and 4 are shown actual speed curves on a time and a distance base, for a train running between stations 2,500 ft. apart. For the purposes of discussion, consider the train weight as 100 tons and in the first case assume it to be on an ascending grade of one-half per cent. From the curves, the speed at the time brakes are applied is 24 miles per hour, and the kinetic energy at that speed, for the train, is 3,800,000 ft.-lbs. The time consumed up to the point where brakes are applied is 77 seconds, and the energy to overcome the 0.5 per cent. grade while the train is passing over the first 1,900 ft. is equal to 1,900,000 ft.-lbs. The energy to overcome train resistance for the same distance is equal to 1,045,000 ft.-lbs. Summed up the energy would be 6,745,000 ft.-lbs.

This represents the total energy that must be supplied to the train from the line of starting, up to the moment the brakes are applied. From this point the acceleration is negative, and the kinetic energy of the train is absorbed by train resistance, the grade and the brakes. The amount taken up by the brakes is 2,900,000 ft. lbs. The above case is for the train on a 0.5 per cent. ascending grade. For the train on a level the figures would be as follows:

For accelerating the train	3,800,000 ft.-lbs
For train resistance	1,045,000 "
Total energy required	4,845,000 "

The amount absorbed by the brakes in this case will be 3,500,000 ft.-lbs.

For the same train and speed conditions for a 0.5 per cent. descending grade the figures are:

For accelerating the train	3,800,000 ft.-lbs.
For train resistance	1,045,000 "
Total energy required	4,845,000 "
Supplied by descending grade	1,900,000 "
Total external energy required	2,945,000 "

The total energy absorbed by the brakes in stopping the train in this case is equal to 4,100,000 ft.-lbs.

The foot pounds per ton-mile in each of the cases cited is as follows:

On a descending grade	142,000 ft.-lbs.
On a level	102,000 "
On descending grade	62,000 "

The average speed taken from the curves in the cases cited is 16.5 miles per hour, not including stops. Allowing 12 seconds for a stop, it is 15 miles per hour.

The power may also be divided as follows;

For accelerating the train	69 H.-P.
For ascending grade	30 "
For train resistance	16.5 "

In a speed curve with a time base, such as Fig. 3, the area enclosed is proportional to the distance traveled. That part of the area enclosed by the curve from B to C, a perpendicular from the point C, and the base line, depends on the form of the braking curve and hence on the efficiency of the brakes. The area enclosed by the curve from A to C, the perpendicular and the base line, depends on the form of the acceleration curve. The distance between stations being fixed, the area enclosed must be constant and independent of the form of the curves. The shape of the curve may be altered, however, in two general ways, first, by changing its form so as to still enclose the same area, with the same length of base, and secondly, by altering the form of the curve and changing the length of the base. This latter change will alter the time between stations, while either of the changes may or may not affect the amount of power used, this depending principally on the maximum speed attained.

The train weight may be considered as made up of two parts, the live, or paying load, and the dead load, which includes the weight of rolling stock, motors, etc. As the amount of power required by the train varies almost directly as the weight, it is desirable to have the non-paying or dead load as small as possible. In order that there may be sufficient traction, a separate locomotive must weigh between four and five times the maximum drawbar pull required by the train, all of which is dead load, in addition to that of the cars. It has been stated that a rapid acceleration is desirable if there are many stops, but as each pound of increased maximum drawbar pull from a locomotive must add four or five pounds to the dead weight of the train, a point is soon reached where no further advantage is obtained by increasing weight on the drivers and drawbar pull. The weight admissible on the locomotive driving wheels, on account of track and structure, also limits the amount of traction, hence the drawbar pull and rate of train acceleration. Thus, for a service combining high speed and many stops, there are advantages in a form of motor which may be so placed as to utilize a part of the car weight and live load for purposes of traction. The cars should weigh as little as possible, so as to reduce the total dead weight of the train, for it is well known that the ton-miles of paying load form only a small percentage of the total ton-miles moved. On elevated reads it is probably below six per cent. on the average and on some roads below one per cent.

It is hoped that these remarks may direct attention to the question of economy in the use of power or to what may be called train efficiency, in contradistinction from the efficiency of the apparatus used in the generation and transmission of the power to the car axles. This latter subject will now be considered.

The Motors and Controlling Apparatus.

In electric motors, the relations between speed, horizontal effort (or torque), current, voltage and efficiency are all fixed, and may be readily determined for any particular motor. For most practical purposes it is best to represent these relations graphically.

In Figs. 5 and 6 the relations between current, speed and horizontal effort are plotted for a standard motor in use on the Metropolitan Railroad at 250 and 125 volts. The static horizontal effort is the same in all cases, but the running horizontal effort is slightly greater for the same current at the lower voltages because the losses which affect it are less at the lower speed. At the same time the percentage of loss due to internal resistance becomes greater, as it depends upon the current flowing, while the total input of energy varies with the electrical pressure as well; hence the reduced efficiency at the lower voltages. In Fig. 7 the efficiency is plotted to the speed, and it will be seen that the curves fall off rapidly above or below a certain narrow range of speed over which the efficiency is high, at any one voltage. There is a considerable range of current and horizontal effort, over which the efficiency is high, but it corresponds to only a small speed variation. The relations of speed to horizontal effort are given in Fig. 8.

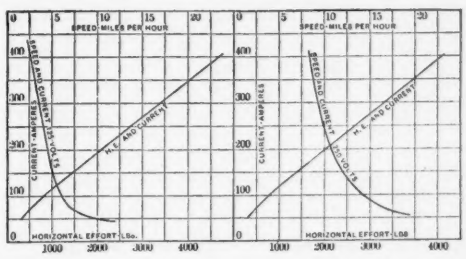


Fig. 6.—At 125 volts. *Fig. 5.—At 250 volts.*

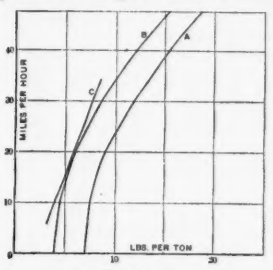
Relation Between Speed and Current, and Horizontal Pull—Metropolitan Elevated.

The maximum working range of the motor is from 350 to 4,000 lbs. horizontal effort, and the total speed variation on this range at 500 volts will be about 14 miles, and at 250 volts about 10 miles. The range of speed obtained in service at any one voltage is practically about one-half this amount, and if 250 and 500 volts be considered as the pressures at the motor, in series and parallel combination, then the total range of speed, without further alteration of the voltage by resistance in circuit, will be about 12 miles over a total speed range of 34 miles. For each combination of motors in series parallel, there is a certain range of speed, over which the efficiency is equal to that of the motors; but at all other speeds resistance must be introduced in circuit and the efficiency is reduced.

The weight of the armature and other revolving parts is a feature of importance in motors designed for a high speed service, requiring frequent stops. These parts should be as light, and the rotative speed as low as possible. The armatures of the Metropolitan motors weigh approximately 1,400 lbs., and are 18½ in. in diameter. At 800 revolutions per minute, corresponding to 25 miles per hour, the kinetic energy in each armature is equal to 43,000 ft.-lbs. Thus for a two-motor equipment, 86,000 ft.-lbs. of energy are dissipated each time the car is stopped from a speed of 25 miles per hour. This amount of energy will vary with the square of the maximum speed and if stops are frequent it becomes an appreciable loss.

The average load a motor is capable of sustaining is fixed by the permissible increase in temperature. The amount of such increase will depend on the average load, the efficiency of the motor and the extent and character of the heat radiating surfaces. The actual load on a railway motor differs at times very widely from the average load, and the ability to withstand these fluctuations will depend in part on the heat storage capacity of the motor. The metal acts to a considerable extent as a reserve of heat, receiving it when the motor is doing its heaviest work and giving it up at lighter loads. A glance at the load diagrams in the latter part of this paper (Fig. 9) will serve to show how great these fluctuations may be under certain conditions. The amount of heat radiated in a given time varies greatly with the speed of the car, and the temperatures. With the air at 60 deg. Fahr., and under average working conditions, a Metropolitan motor will radiate heat at the rate of about 650 British heat-units per minute, This is equal to 15 H. P., corresponding about to 60 H. P. of loading. But these motors will readily withstand for a considerable period of time a load of three times this amount. Most of the heat produced by this additional loading must be stored in the metal of the armature and frame. A considerable part of the heat is generated in the armature, but its thermal capacity being nearly 150 H. U. per degree, a large amount of heat energy can be stored before the temperature reaches the danger point. Slow-speed armatures in general have more metal in them, and are thus better able to stand a variable load.

The selection of the proper motors and controlling apparatus for a given service deserves more attention than



Curve A, by Clark's Formula.
" *B, by Formula* $R = 4 + \frac{V^2}{200}$.
" *C, by Metropolitan Elevated Formula* $R = 2 + .19\ V$.

Fig. 2.—Train Resistance for Different Speeds.

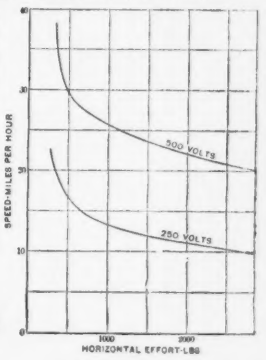


Fig. 8.

it has generally received. The horse-power and maximum speed have too often been the determining quantities. A rating based on horse-power is now understood to be of little value: and the maximum speed of which a motor is capable may be of still less account as representing its performance with a train. Quite generally, motors have been speeded too high, the result being insufficient starting torque, a poor commercial efficiency and less average speed than a better selected motor would have developed.

The Generators and Feeder.

Anything like a complete discussion of modern railway generators or of the problems connected with railway feeders, might well be the subject of a separate

* This formula is derived from fundamental equation $f = Ma$ where M (mass) $= \frac{W}{g}$ and a (acceleration) $= \frac{v}{t}$.

* See *Railroad Gazette*, May 21, 1897, and other issues; also see editorial note this week.

paper. It is designed here simply to touch upon a few points relating to the general system.

Railroad generators at the present time are nearly all of a direct-current type, but there is reason to believe that in the future two and three phase alternating current machines will be installed. The development of the rotary transformer will be largely responsible for this change in practice. Power stations can be more favorably located in respect to fuel and water supply, and through sub-stations furnish power to larger areas. With this change will come also greater economy in the producion of power, which cannot but have a favorable effect on the development of the electric railroad.

The commercial efficiency of railroad generators varies from 90 to 95 per cent. Under favorable conditions the average or "all day" loss for large direct-connected machinery (units of over 600 KW.) is about 7 per cent. Direct-connected alternating current generators give about the same efficiency as direct current generators. Commercially, the best results are obtained with a few units of large size. It is unnecessary and poor practice to install many small units for railroad work.

The load line of an electric railroad is subject to two kinds of fluctuations: first, those sudden changes caused by the starting together of a number of trains, and secondly, the more gradual change due to the variation of traffic at different hours of the day. On roads operating but few cars, the fluctuations due to the first cause are of considerable amount, but on large systems, with many cars, the changes in loading from starting up of trains are very slight—hardly noticeable, in fact—and this is especially the case if the feeders are tied together and form a network. There still exists, however, the change in the load line corresponding to the traffic. A railroad load line differs from that of a lighting station in having two nearly equal "peaks" or points of maxima, one in the morning and one in the evening. These variations are best taken care of by cutting in and out units, while the momentary changes can usually be cared for by a slight overloading of the machinery. Engines and generators for railway purposes have a good efficiency over quite a wide range and generally stand overloads ver well. In Fig. 9 aree shown seven load curves from the power station of the Metropolitan Elevated. The curves correspond to th, days of the week and indicate the average power taken but do not show momentary fluctuations, caused by the movement of trains. The chief characteristics of these curves are the two decided "peaks" occurring daily and with great regularity. The peaks vary as to amount and time with the season of the year and to some extent with the weather, but are always present in a marked degree. Street railroads with many lines extending to different parts of a city usually show a station load with less decided and broader peaks. This is due in part to the habits and occupations by the patrons of the various lines which determine the hours of maximum traffic. When combined, the load curves from a number of such lines will give a more favorable station load than any one line or group of lines in the same section of a city.

The load curves of the Metropolitan have proven to be a very sensitive index of the traffic. A delay on the competing cable lines or increase of travel from any cause is at once noticeable in the power-house. The greater station loading is due not so much to the increased weight in passengers carried as to the longer stops necessary to discharge and to take on passengers, thus requiring a higher speed to keep the trains on time.

The feeder system has an effect upon the form of load curves as well as upon the total amount of energy required. The highest percentage of loss will occur at the moment of greatest loading, but this rarely takes place at the same time on different sections, and an advantage is obtained by connecting the lines together to form a network as far as possible. Feeders are usually divided into sections as a matter of safety and convenience. The best economy of copper and power, and the most favorable load lines are obtained when the number of such sections are as few as consistent with the safety and flexibility of the system. When feeder sections are connected the best practice calls for a fuse or circuit breaker in this circuit. The permissible percentage of loss between the power-house and the trains is partly a commercial question, depending on the cost of power, and interest on the feeder investment. Transformers, rotary converters, boosters, batteries and similar apparatus forming a part of the feeder system should be considered with special reference to cost, operating expense, all-day efficiency and effect on the load factor of the generating station.

The Efficiency of Transmission.

The energy dissipated between the engine and the car axles may be divided into three parts—that lost in the electrical generators, the losses in the transmission lines (including transformers, rotaries, etc.), and the losses in the car controlling apparatus and motors.

The amount of loss in the generators will depend upon their efficiency and average loading. Modern railroad generators have good efficiency above half load, and in stations designed with reference to the load line there is very little difficulty in keeping the machinery above three-quarters at all times.

With machines of this type and size the all day efficiency ought to be about 92 per cent. A sub-station provided with rotaries and static transformers working under a good average loading should have an efficiency of about 89 per cent.; a loss of 8 per cent. in the rotaries and 3 per cent. in the transformers. The sub-station apparatus is at its highest efficiency at the time of greatest loading, when the feeder lines are at the lowest efficiency, and thus have a favorable effect on the load line.

The losses on railroad feeders vary from 10 to 25 per cent. Often there is sufficient copper if rightly distributed and tied together to reduce this at least one-half Such a change would also improve the load factor and increase the efficiency of the station. The losses in the motors and car apparatus have already been referred to in this paper, but actual data and tests are here introduced in evidence.

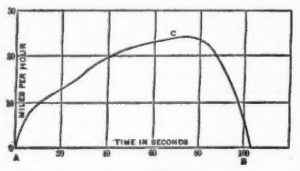


Fig. 3.

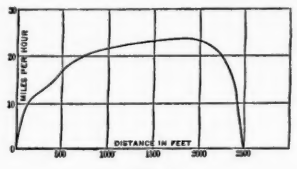


Fig. 4.

Speed Curves Between Station on Metropolitan Elevated.

From a large number of tests made on trains of the Metropolitan Elevated road, those given in the accompanying table have been selected as illustrating this part of the subject. The trips are numbered from 1 to 8, and in the table the data for each trip are given, together with the general results obtained. All of these runs were made on a dry track, in moderate weather and under average working conditions. The total electrical energy at the train was measured by Thomson recording wattmeters and the voltage and current by Weston instruments. The velocity record was taken from a Boyer speed recorder and the stops and average speed from a double set of stop watches. The pressure at the station was measured by a recording voltmeter.

Trip No. 3 was made from Franklin street over the Logan Square line with a three-car train heavily loaded, and the speed and current diagrams on a time basis for a part of the run are shown in Fig. 10. The maximum grade going west is 75 per cent., ascending for about 2,350 ft and descending for about 1,950 ft. Other grades are very small.

TABLE SHOWING EFFICIENCY OF ELECTRIC TRACTION ON METROPOLITAN ELEVATED RAILROAD, CHICAGO.

No. of trip	1	2	3	4	5	6	7	8
No. of cars in train	4	4	4	3	3	2	2	4
Total time of trip, minutes and seconds	28—23	29—03	28—30	28—37	27—26	25—30	23—48	32—44
Total time of stops, minutes and seconds	2—19	2—05	2—42	1—47	1—16	0—54	1—22	1—41
Time running, minutes and seconds	26—07	26—58	25—58	26—50	26—10	24—36	22—26	31—03
Average speed (including stops), miles per hour	13.3	13.0	13 2	13.88	14.4	14.9	15.9	11 53
Average speed (not including stops), miles per hour	14.4	14 0	14.5	14.7	15.1	15.3	16.8	12.2
Average current (including stops), amperes	138.3	142.6	138.6	130.2	129.5	99.1	106.6	101 1
Average current (not including stops), amperes	148.7	153.2	151.8	137.4	135.6	92 5	112 4	106 1
Average volts (at the train), amperes	504	498	503	512	510	521	529	539
Efficiency from generators to car axle, per cent	51	50 5	52	50	51	51 5	50	47 5
Kilowatt hours per car mile (at the train)	1.32	1.36	1.3	1.69	1.62	1 58	1.76	1.11
Kilowatt hours per car mile (at the station)	1.44	1.52	1.44	1.81	1.68	1 67	1.83	1.21

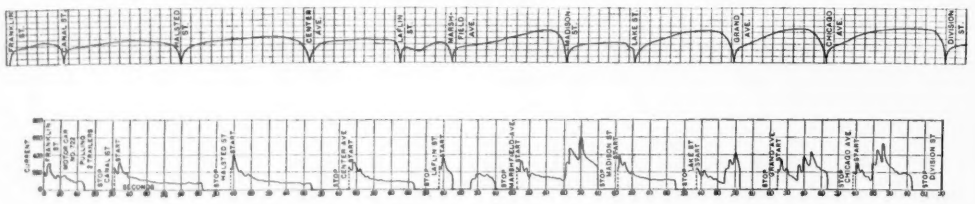


Fig. 10.—Diagrams Taken from Three-Car Train, Showing Speed and Current Consumption Between Stations on Metropolitan Elevated, Chicago.

rapid acceleration and from reduced train weight and the total direct advantage for the electrical system is obtained as far as economy in power is concerned.

While any reduction in the cost of power (not only for fuel, but repairs, labor, water, oil and waste, etc.) is of great importance to railroads, the many other advantages of electricity, representing betterments of the service and greater earning capacity, are the chief qualities which will determine its adoption in any case in place of steam locomotives. As a motive power electricity is simple, efficient and wonderfully flexible, and it is hardly wise to predict its limitations.

The Harbor of Montreal.

A good idea of what our neighbors are doing in the way of improving deep water navigation in the St. Lawrence can be got from the annual reports of the Montreal Harbor Commissioners. That for the year 1896 has been received within a few weeks.

Following the customary practice, the several reports of the officers of this Commission, together with the President's statement of the business of the port for the year, have been issued in pamphlet form.

The President's statement has been somewhat delayed in the hope that it might include the result of the negotiations being made to enlarge the harbor and settle upon a plan to provide for the future wants of the port. No decision being reached, this could not be done, but the progress made leads to the hope that a satisfactory arrangement will soon be made. The Commissioners have endeavored to have the improvements carried out in such a way that the trade of the port will not be hurt by any increased tariff charges to pay interest. Representations have even been made to the Dominion government in favor of making Montreal a free port.

In April of last year an act was passed by which the

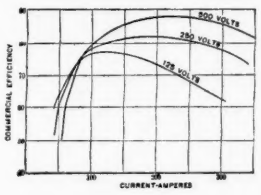


Fig. 7.

$1,000,000 borrowing power, granted to the Commissioners in 1891, was continued, the money to be expended in new works to be approved by the Minister of Public Works. The same act empowered them to borrow an adtional $1,000,000 for the consolidation of $489,000 harbor bonds bearing five and six per cent., which matured during the year, and for temporary advances for carrying on the new works during 1894 and 1895; and also authorized the Dominion government to advance the said $2,000,000 on security of Montreal harbor bonds bearing 3½ per cent. interest. At present the bonded debt of the harbor is $3,322,000. The total interest paid last year on bonds and loans was $135,824, as against $140,320 in 1895. Besides the above mentioned $3,322,000, borrowed since 1830, there has been over $1,000,000, the surplus revenue accumulated during the same period, expended on working plant, wharves and other improvements, making a total expenditure of $4,381,857. The total wharfage at the end of the year was 5.8 miles, nearly 4.1 of which carried 27 ft. 6 in. and over, the remainder being 10 ft. deep.

The total ordinary revenue for the year was $258,132, and the expenditure for management, maintenance and interest was $228,643, which leaves a surplus of $29,489 over working expenses. While the trade of the harbor shows a large increase in exports, as compared with previous years, the import trade, however, somewhat falling off, still the ordinary revenue was $15,411 less than in 1895. This decrease is explained by the fact that in the latter part of June a reduction of 20 per cent. in wharfage tariff went into effect. Otherwise the total revenue would have been from $43,000 to $45,000 more than it actually was. In spite of the 20 per cent. reduction, the receipts from exports showed an increase of nearly 13 per cent., and for the first time in the history of the Commission exceeded that derived from imports.

The Harbor Master's report shows that 709 seagoing vessels, with a tonnage of 1,216,468 tons, arrived in port during the year. This is an increased tonnage of 147,082 tons over 1895. There were 4,832 inland vessels, with a tonnage of 1,004,117 tons, that arrived in port, an increase of 344 vessels and 66,000 tons tonnage.

The principal new works of the year were the filling along the shore at Maisonneuve, in position to form a part of future wharves; the finishing and macadamizing of the new pier and shore wharf at Hochelaga; the dredging of shoals between the wharves and ship channel at the same place; dredging in ship channel and the spaces between the channel and the wharves at various places from the lower end of Ile Ronde to the Lachine canal; the deepening of half the breadth of Windmill Point basin and lengthening it to its intended limit and building a wharf around its upper end; and extending the guard pier. The total amount spent on these works and on the plant was $233,510, $6,763 of which was on behalf of the city of Montreal for work on the guard pier. To this improvement, which is an essential feature of the harbor, 84,204 cu. yds. of material was added last year. It was thus lengthened to within 500 ft. of the Victoria bridge, but the action of the ice last winter showed that some further extension may be needed.

During the year 401,938 cu. yds. of material was dredged at a total cost of $103,317, or 25.70 cents per cubic yard. This represents the entire cost of working, including repairs, fuel, wages, salaries, the cost of tug and scow service, and all other outlays except interest on capital and depreciation of plant. It also includes the cost of depositing, by floating derricks, 28,864 cu. yds. of material received in scows from city excavations. The total quantity dredged was less by 94,950 cu. yds., or about four per cent. of what it was in 1895; while the cost of the year's work was four per cent. higher. But, on the other hand, 34 per cent. of the dredging of 1896 was rock, while only 14.5 per cent. of rock was dredged the year before, so the general results of dredging are considered good, and show an improvement over those of any previous year. Spoon dredges were used in this work. In connection with these, Mr. John Kennedy, Chief Engineer of the Commission, says that the great saving effected by the use of large and powerful dredges, as compared with the use of small dredges, is clearly shown. Speaking generally, the cost of dredging earth by the

large dredges is about half of that by the small; dredging rock by the large dredges is as cheap as dredging earth by the small; the large dredges can work well in current or in hard stuff, where the small could do nothing. He recommended that it might be wise to keep one small dredge for special work, but both time and money would be saved if the other two were sold at any price, or simply discarded, and a powerful one built to take their place.

The Department of Public Works was active in the improvement of the ship channel of the St. Lawrence between Montreal and Quebec. This work had been prosecuted in years previous to 1896, and it has been continued during the current season. It is proposed to widen the channel throughout to 500 ft. and deepen it to 30 ft. In order to do this, a new survey will have to be made of the river between Montreal and Portneuf to connect with the survey recently completed between the latter place and Quebec. The principal operations carried out by the Government during 1896 were the widening and deepening of the channel where most necessary between Montreal and Lake St. Peter; the deepening of the Pointe aux Trembles channel to 28 ft. 6 in. at low water and the widening of the curves both above and below the point; the widening of the curve opposite Ile Delorier, at Cap St. Michel, to 550 ft. in its narrowest place. A 400-ft. channel, with a depth of 28 ft. 6 in. at low water, was completed through the Barre a Boulard, near Lotbiniere, in August. When this was done, it was decided to widen this channel to 500 ft., while the plant was still there, so the dredge was placed at work on the south side of the cut and good progress was made before the close of the season. One elevator dredge worked the entire season in the channel in Montreal Harbor. The work of the current year has been the further widening and deepening at Maisonneuve and Longueuil; the completion of widening and deepening at Pointe aux Trembles; the widening of the channel at Pouillier, Varennes and Cap St. Michel; the deepening of the sand bar at Pointe Citrouille; the widening of the curve at the lower end of Coutrecœur channel; the further widening of the 400-ft. channel at Barre a Boulard, looking to its completion, and the commencement of a 500-ft. channel at Cap Santé and Ste. Croix.

Labor-Saving Devices at the Brooks Locomotive Works.

A good example of the advance in the use of tools worked by compressed air and hydraulic power and of machines driven by electricity is afforded in the case of their introduction at the Brooks Locomotive Works, Dunkirk, N. Y. Each of these powers has been applied to the specific work for which it is especially adapted. In this instance we find that tools have been introduced after a somewhat careful estimate of the power required, their cost, etc.; furthermore, the saving in each case is known with some degree of accuracy, and with the electric motors this is very apparent. Before their introduction six horizontal tubular boilers were required for constant service, and after the motors were put in the shops (aggregating in all over 150-H. P.) but five boilers were required. This is unquestionably the most satisfactory manner in which to obtain the actual saving, and it is regarded by many as the only fair test that can be made.

The engine room contains two Buckeye engines, one of 200-H. P. and the other of 100-H. P., both directly connected to Western Electric generators. In addition to the current for the motors, which are located in different parts of the shops, all the buildings are lighted by current from these generators. The motors in the shops include a 25-H. P. Western Electric motor drivin rollers, one of 7-H. P. driving punch and shear, and a 10-H. P. Gibbs machine driving punch and shear. A 20-ton crane with a 70-ft. span is driven by a General Electric motor, while in the foundry a 35-H. P. motor drives the blowers, and in this same room two cranes of 10 tons capacity each with a travel of 40 ft. are worked by General Electric motors. So throughout the different departments the electric motors are being used to perform a large variety of work. On the transfer table a 30-H. P. Westearn Electric motor is now doing the work that was formerly done by two steam engines. Probably one of the most serviceable devices is a 4-H. P. portable motor with a flexible shaft attachment by means of which any part of an engine can be worked upon with but little inconvenience and delay.

Water power has found its place in working two hoists in the machine shop and three hydraulic riveting machines and a hoist for raising material in the boiler-room. Two small cranes are also operated by this power. The water for the hydraulic elevator is pumped by means of an electric motor, so that we have here water and electricity both working to advantage. The pressure in the water pipes leading to the different devices averages about 1,000 lbs per square inch.

Air for the pneumatic tools is furnished by a large compressor, the working pressure being from 70 to 100 lbs. While the pneumatic tools have not been used very extensively, their service thus far has been very satisfactory, especially in chipping and calking.

TECHNICAL.

Manufacturing and Business.

William A. Canty has severed his connection with the screw machine department of the Pratt & Whitney Co., Hartford, Conn., to take the superintendency of the screw machine department of the Davis & Egan Machine Tool Co., Cincinnati, O.

The Standard Paint Co., 81 John street, New York City, has received an order to furnish P. & B. Ruberoid car roofing for the 350 refrigerator cars ordered by Swift & Co. from the Michigan-Peninsular Car Co.

The Carnegie Steel Co., Ltd., of Pittsburgh, Pa., is reported as having received contracts for 12,000 tons of bridge material for the Atchison, Topeka & Santa Fe and 4,000 tons for the Pittsburgh, Fort Wayne & Chicago. Further contracts from the latter road are expected to be placed this week.

The Empire Forge Co., of Lansingburgh, N. Y., denies the sale of its foundry to the Palmer Hardware Co., as reported.

The Davis & Egan Machine Tool Co., of Cincinnati, O., has been awarded a contract by the French government for four heavy 36-in. standard engine lathes, with 22 ft. beds. These lathes are to be equipped with metric lead screw and full set of change gears for cutting a large range of threads of the metric pitch. The lathes will be shipped from Cincinnati about Dec. 1.

The Chicago Railway Equipment Co., of Chicago, Ill., makers of the National hollow brake beam, shipped 200 brake beams on the steamer "Columbia" from Tacoma, Wash., on Sept. 4, for the Chinese Imperial Railway. This is the latest of a number of shipments that have been made by the same company.

The Pneumatic Railway Signal Co. has been organized with an authorized capital stock of $1,250,000, to put on the market the McCartney pneumatic interlocking signal. The officers and directors are: President, John N. Beckley; Vice-President, Charles M. Everest; Secretary, Thomas A. Smyth; Treasurer, George W. Archer, and Engineer, Frank L. Dodgson. The Board of Directors includes George C. Buell, Jr.; Frederick Cook, Albert H. Harris, George Weldon, William Bartholomay, Bernard Dunn, Adolph Spiehler, W. F. Carlton and J. H. McCartney. The office of the company is at 414 Ellwanger & Barry Bldg., Rochester, N. Y.

Maris Bros., manufacturers of traveling cranes, Philadelphia, Pa., are erecting a new machine shop to meet the demands of their increased business. The building will be 55 × 75 ft. Running the full length of the building will be a 10-ton power crane having a span of 30 ft. One side of the building will be arranged with a gallery on which will be placed the lighter machinery. The framework of the building will be steel, and the covering of the sides and roof will be corrugated iron. Contract for the complete building has been let to the Berlin Iron Bridge Co., of East Berlin, Conn., who designed the structure, and will furnish and erect all the material.

The U. S. Metallic Packing Co., of Philadelphia, Pa., reports sales of 109 Dean locomotive track sanders during the month of August.

The entire plant of the Pennsylvania Bolt & Nut Works, at Lebanon, Pa., is running day and night.

The Bethlehem Iron Works Co., of South Bethlehem, Pa., has received a contract to furnish new forgings for the engine of the torpedo boat Rogers (built by the Columbian Iron Works & Dry Dock Co., of Baltimore, Md.), to replace some which broke last week. The original forgings were not made by the Bethlehem Iron Works Co.

Iron and Steel.

Last week the price of Bessemer pig iron at Cleveland was advanced 50 cents a ton, making the price $10. Mill iron is $9.25 and Southern iron $9.90.

The Altoona Iron Co., of Altoona, Pa., is building a new brick and stone boiler-house, 45 × 40 ft. It will be equipped with three 125-H. P. boilers.

At the annual meeting of the Brown-Bonnell Iron Co. of Youngstown, O., last week, the following directors and officers were elected: Samuel Mather, Robert McCurdy, H. C. Boughman, Henry Wick, John I. Wiliams, Daniel Eells and Joseph Forker; President, Samuel Mather; Robert McCurdy, Vice-President; John F. Taylor, Secretary and Treasurer; J. M. Butler, Assistant Secretary, and John I. Williams, general manager.

The property of the Premier Steel Co., at Indianapolis, Ind., will be sold by order of the court, Jan. 15, 1898. It has been in the hands of a receiver since April, 1893.

The Struthers Furnace Co., of Struthers, O., has put its new furnace in blast.

The Ohio Iron & Steel Co., of Lowellville, O., has placed an order with the Wheeler Boiler Co., of Sharon, Pa., for one 325-H. P. Wheeler water-tube boiler.

The following directors of the Thomas Iron Co., at Hokendauqua, Pa., were elected last week: Samuel Thomas, B. F. Fackenthal, Jr., J. S. Rodenbough, J. Samuel Krause, W. H. Hulick, Willian Hardenberg and Frederick R. Drake. B. F. Fackenthal, Jr., was elected President; William H. Hulick, Vice-President, and James W. Weaver, Secretary and Treasurer. Mr. Krause was elected a member of the board in place of James Fuller, of Catasauqua, and Mr. Rodenbough in place of Charles Stewart.

New Stations and Shops.

The Chesapeake & Ohio has had under consideration for some time the elevation of its tracks in Richmond and the building of a new station there. This work may be done in the near future, but no time has yet been decided upon.

It is reported that the Detroit & Lima Northern Railroad will build a new passenger station at Adrian, Mich.

The Consolidated Traction Co., of Pittsburgh, Pa., is building on Frankstone avenue, between Lang avenue and Collier street, a new general repair shop 576 × 135 ft., a terminal car station 218 × 135 ft., and a storage house for cars 300 × 135 ft. A car station is also being built at the Highland Park terminus. Work has been begun on a new power-house at 20th street and the Allegheny River. It will be equipped with six 2,500-H. P. engines and an equal number of dynamos. The Ft. Pitt Bridge Co., of Pittsburgh, will build the car barns.

The new station of the Boston & Maine, at Beverly, Mass., has been finished. It is 116 ft. 6 in. × 30 ft. one story high with a red slate roof. The main waiting room is 60 × 30 ft. with a ticket office in one corner 15 × 15 ft. The interior and exterior of the building is of white brick with cypress wood finish. The baggage and express room is 30 ft. square and located in the northern end of the building.

The Ohio River Railroad is building a new passenger station at Sistersville, W. Va. The principal dimensions are: Main building, 120 × 27 ft., with wing in rear 68 × 15 ft.; carriage shed at north end, 50 ft. long; platform, 16 ft wide, extending entire length of building and carriage shed. The baggage-room at the north end is 12½ × 26 ft.; express-room, 10 × 26 ft.; women's waiting-room, 18½ × 26 ft., with toilet-room in rear of waiting-room. Connecting with the women's waiting-room (by a large arch) is the men's waiting-room, of the same dimensions, with toilet off. The ticket offices are between the waiting-rooms. Next to the men's waiting-room is a lunch room, 25 × 21 ft., with entrance from platform through a bay window, corresponding to a bay window in the ticket offices. In rear of lunch-room is kitchen, 16 × 24 ft., and a store-room, 10 × 12 ft. A lunch-room adjoins the main dining-room, and is 14 × 26 ft. There will be five full sized, finished rooms on the second floor with hardwood floors. The roof will be black slate. The contractors are Brown Bros., of Parkersburg, W. Va., and the architect, William Howe, of the same place.

Steam Heat.

The Houston & Texas Central is equipping passenger cars with steam heat.

Rules for Loading Lumber, Etc.

The Master Car Builders' Association rules governing the loading of lumber and timber on open cars, and loading and carrying structural materials, plates, rails, girders, etc, as revised by the convention of 1897, are now ready for delivery, prices as follows: Twenty-five copies, $1; 50 copies, $1.75; 100 copies, $3. A less number than 20 copies at five cents per copy.

Automatic Block Signals.

The Hall Signal Company has contracted to furnish for the Illinois Central 38 semaphore signals to be operated by electric motors actuated by batteries. These signals are to be used in automatic rail circuit block signals on the company's St. Louis line south of Gilman, where a second main track has lately been put in. The Illinois Central has had 16 of these signals in use for several months and they have made very satisfactory records. The motor is placed on a bracket fixed to the post below the semaphore arm and above the balance lever, and pulls the signal to the clear position by means of a chain attached to the weighted end of the balance lever. There will be a starting, a home and a distant signal at each station. With the signals already in service this contract will equip about 20 miles of double track. The signals will stand normally at danger.

The Hall Signal Co. has equipped with its automatic disk signals the new depressed roadway of the Boston & Albany through Newton, Mass. This piece of road is about 5 miles long, from Faneuil to Riverside, and there are four main tracks, making 20 miles of track signaled. The signals stand normally at danger.

Pintsch Gas and the D. & R. G. Accident.

We commented briefly last week on the statement that the Denver & Rio Grande train which was involved in a collision at Newcastle was set on fire by an explosion of the Pintsch gas tanks. An officer of the road informs us that he has seen all of the Pintsch tanks and there is no evidence of an explosion having occurred in any one of them.

The Water Power Project at Richmond.

A plan is being worked out for using some of the power of the James River at Richmond to generate electric power for transmission to consumers in the neighborhood. The General Electric Company has made provisional contracts with consumers to the amount of about 2,500 estimated horse power. It is estimated that they must get contracts for 3,500 to 4,500 horse power before beginning work. The company is now applying for a franchise from the City Council and expects to apply for a charter at the next session of the Virginia Legislature. There is a possible development by using a system of storage of from 12,000 to 15,000 horse power the year through.

Electric Headlights.

The Pyle-National Electric Headlight Co., office Monadnock Block, Chicago, factory Indianapolis, provided itself at the outset with factory facilities for making one complete engine equipment a day, thinking that that would answer the purpose for at least a year. The company is now three months behind its orders and is preparing to multiply the size of its factory several times.

Bezer's Revolving Signal.

One evening last week, while the signal engineers were in New York on the occasion of their club meeting, a party of them and of other railroad men went out to

Kingsland, on the Delaware, Lackawanna & Western, to see Mr. Bezer's revolving signal, which we have heretofore described. It will be remembered that this signal is so arranged that the semaphore arm to display safety turns continuously around a pivot at its center, like a wing of a windmill. At danger the semaphore is motionless. The only change that has been made—and this is what Mr. Bezer wished the party especially to see—is in the night signal. Heretofore he has used a lamp turning on a vertical pivot showing red for danger and white for all clear. Now he uses a fixed red light, in front of which the semaphore blade turns, thus producing a series of red flashes for safety and a steady red light for danger. Several of the railroad officers present were agreed that the objection to running against a red light was more than offset by the other good features of this signal.

Firing to Prevent Smoke.

The officers of the Columbus, Sandusky & Hocking Railroad are making special efforts to get clean and efficient firing. Their engines are equipped with water tube arch bars on which the brick arches rest. Air is introduced from outside the firebox, through the brick arch and let into the firebox at the highest point of the arch. This is practically the system in use on the Cincinnati, New Orleans & Texas Pacific, where the passenger trains are as free from smoke and cinders as if they were hauled by anthracite-burning engines. In addition to this arrangement the following instructions and orders are issued to locomotive enginemen and firemen for the purpose of securing economy in the consumption of fuel and to prevent as much as possible the smoke nuisance:

Bituminous coal contains a large quantity of gas. When this coal is thrown upon a hot fire, the gas is driven off in a few seconds. If air can be mixed with this gas as it rises from the coal, the gas will be consumed and will generate heat; otherwise the gas, together with small particles of coal, will pass out of the stack unconsumed in the form of dense, black smoke, which causes a waste of valuable fuel, and creates an unnecessary nuisance in the shape of smoke. The formation of smoke can be largely prevented by careful firing. If but one shovelful of coal is thrown into the firebox at a time, and the door is left slightly open for a few seconds so as to admit air, the air will mix with the gases from the coal and they will burn. Then the door can be closed tight. The practice of putting several shovelfuls of coal in the fire without intermission is wasteful and creates unnecessary smoke. Firemen are required to study and learn these points, and to carry as light a fire as possible, always remembering that a light, bright fire gives more heat than a heavy, dull one. The engineman should use the injectors with judgment, so that the fireman will be able to fire the engine regularly and thereby economically, which he can only do with the full co-operation of the engineman.

Before leaving terminals on passenger trains the blower must be put on and a sufficient amount of coal put into the firebox to make a good solid fire. After the coal is put in, the door must be left partly open until the smoke from the stack has ceased, after which the door can be closed tight. By this means smoke at stations will be practically avoided. After leaving terminals the firebox door must be left partly open on the first notch after each shovelful of coal is put into the firebox, until the smoke from the stack has disappeared, then the door must be entirely closed. In approaching stations with passenger trains where a stop is to be made, the blower must be put on and the door slightly opened so as to prevent smoke.

These rules must be observed on night as well as upon day trains. Promotions of enginemen to passenger train service and promotions of firemen will be largely governed by their records in carrying out these instructions.

THE SCRAP HEAP.

Notes.

The Chicago & Northwestern is equipping its main line through to Council Bluffs with the signals and telegraphic apparatus necessary to put in operation a telegraph block system through to the Missouri River.

The Union Pacific, Denver & Gulf has for some time been running a few passenger trains in which the cars are equipped with gates, and it is reported in the Denver *Times* that gates will be put on all the passenger cars of the company.

Business in China.

Advance sheets of consular reports of the Department of State for October contain a statement from Consul Read at Tientsin, to which he attaches a letter from Taylor & Co., of that city, of which the following is a part: "China in the next few years will be a buyer for all classes of machinery, and especially railroad materials. It has been demonstrated that America has chances as good as those of any other country to secure orders. If our American manufacturers will make the proper efforts, it will result in millions of dollars of trade. A commercial representative should be selected, care being taken that he has influence in the proper quarters, which, as you know, is absolutely essential. This representative should be the sole agent in the East. He should be authorized in the propor form, as are the representatives of European houses, with the seal of the Foreign Office, and his name should be registered here in the consulates. In the construction of a railroad, the Chinese require rails, sleepers, couplers, and structural iron for bridges and locomotives. If the best houses in America will place their respective business interests in the hands of one good business firm in Tientsin, this firm can bid for everything wanted, will appear strong in the eyes of the Chinese, and each transaction will, perforce, strengthen the mutual business relations between America and China. If we may be allowed to do so, we would advise that you lay all we have to say before the officials of the Department of State at Washington, with the suggestion that they call the attention of our manufacturers of railroad materials, including the Westinghouse air brake and Wharton switch companies, and manufacturers of fire-arms, locomotives, and men-of-war to the existing opportunities for doing business in this section of the world. We have information that the Chinese Emperor has issued an imperial edit authorizing the purchase of six first-class battleships, six first-class cruisers, six second-class crusiers, and twelve torpedo boats. The Chinese government is going to create a loan of 100,000,000 taels, a part of which will go toward purchasing the vessels. Unfortunately, America has suffered by adventurers, who have no visible means of existence and who come to China willing and anxious to advance or accept any visionary scheme that offers the least prospect of success—schemes that no business man would have anything to do with, and each failure sets American interests further in the rear."

Mr. Read speaks of the presence in China of Mr. C. D. Jameson, representing the Baldwin Locomotive Works, of Philadelphia. It seems that Mr. Jameson made a contract with the Chinese government for four locomotives to be delivered at Tangku on or before June 30, 1897; also, for eight locomotives to be delivered between July 20 and September 20, 1897. In a communication dated Tientsin, June 8, 1897, Consul Read says that all the locomotives were shipped by steamer on or about the middle of May. The first four would arrive slightly after the date they were due, but as the other eight would reach China some time in advance, the consul adds that the Chinese seem satisfied.

American Railroad Securities as Investments.

Some of our American contemporaries are greatly exercised to account for the apathy with which British investors generally have watched the revival of speculative activity in American railroad securities. One very palpable deterrent to the purchase of American railroad shares on this side is the bitter experience which investors have had in the past from similar operations. Over and over again they have been utterly misled with regard to the financial position of the undertakings in which they have been induced to interest themselves In particular, the bookkeeping methods of many of the railroads of the United States are of the most unsatisfactory character. A second reason is to be found in the doubts entertained as to the permanence of the industrial improvement at present going on in the United States, and as to the future prosperity of the railroads. In various ways the expansion of trade and the prosperity of the agricultural interest will beneficially affect the railroads, and there can be little room for doubt that the increase of gross earnings will continue for some time to come. But one swallow does not make a summer, nor does one exceptionally good season assure a permanent improvement. Moreover, though at present the currency question has been pushed into the background, owing to the fact that the stocks of gold in the treasury and in the banks have been replenished and the power exists of withdrawing the precious metal from Europe, yet that question has not been settled, and until a settlement is effected there remains the danger of fresh monetary disturbance.—*The Economist.*

New York State Canals.

On Wednesday of last week State Engineer Adams and State Superintendent of Public Works George W. Aldridge held a conference with the Executive Canal Committee, an association representing the boards of trade and other commercial bodies throughout the state. The meeting had to do with the further improvement of the canals under the $9,000,000 general canal improvement appropriation. About $7,500,000 of work has been completed or is under contract, a good portion of which is on the Erie Canal. The improvement of the western division of the Erie is fully provided for, except the new steel lifting lock, to take the place of the five locks now at Lockport, which will cost $500,000. The middle division improvement has all been contracted for, but quite a stretch of the eastern division of the Erie is not yet under contract. The representatives of the Oswego and Champlain canals were of the opinion that too much of the money had been spent on the Erie, and they thought that what remained should be devoted to the improvement of the Oswego and Champlain canals. The representatives of the Erie objected to this. They thought the balance of the $9,000,000 should be devoted to completing the Erie improvements, but when they were made aware of the fact that this balance was not sufficient to complete the improvements they agreed to the expenditure of the major portion of the remainder of the $9,000,000 on the Oswego and Champlain canals.

The members of the committee will call a meeting of the canal and commercial interests which they represent some time within the next few months, when steps will be taken to secure the additional appropriation which it is found will be needed to make the entire scheme of canal improvement complete.

The Cast-Welded Joint in France.

The Falk cast-welded joint is being introduced in France by La Compagnie Française pour l'exploitation des procédés Thomson-Houston. We are informed that it has been adopted for the rails of the system of the Omnibus & Tramways Co, of Lyons, but we do not learn that it is yet being used by any other French company.

The "Yank" in Australia.

The Railway Commissioners of New South Wales are experimenting on the Sydney tram lines with an open car of American make and design. The new car is the theme of local admiration and of eulogistic notices in the press. The old car, which is its companion on the road, is practically deserted. Everybody, in fact, rushes to this elegant and attractive vehicle, which not long ago was publicly tried for the first time. It is said that as a summer car it would be difficult to surpass it. It is perfectly open from end to end, the sun, wind, or rain being excluded by cleverly designed blinds, which can be lowered or raised at will, and which, being on the automatic principle, stop just exactly in the position wished. The seats are reversible, being made of light wood, beautifully polished. It runs particularly smoothly, and has accommodation for 40 passengers, with a small cab at either end for the man controlling it. This, of course, is when the car is driven by electricity. The real name is "The Brill Car," being manufactured by the firm of that name in Philadelphia. The truck on which it runs is called the "Peckham" truck. The car being about half the weight of those at present in use, will effect a large saving in haulage.—*Transport.*

The Earnings of Two Ship Canals.

Not by a very long way have the anticipations of the Emperor William and his government been realized in the matter of the Baltic Canal traffic. The canal has now been opened two years. In the first year 16,834 vessels of 1,505,903 tons passed through the waterway, and in the second year 22,081 vessels of 2,036,861 tons register passed. Those who were responsible for the official statistics submitted to the government expected a yearly traffic of 18,000 ships of 5,500,000 tons, and receipts amounting to over 4,000,000 marks. While the anticipated number of vessels was almost reached in the first year, and was actually passed in the second, the tonnage estimates were very far from being fulfilled. But the receipts for the first year amounted to only 897,451 marks, and last year to 1,086,432 marks.

The Corinth Canal also makes a poor show as regards the results of opertions. These, it is true, are slightly better than those obtained in 1895, inasmuch as the accounts of 1896 balanced off with a profit of £2,372, while those of 1895 resulted in a loss of £2,820. The improvement was due more to a reduction of working expenses than increase of traffic, however. The substantial diminution of £5,025 was made in working expenses, while the traffic receipts increased £157. The position of the undertaking is still, however, extremely discouraging, the amount expended on capital account having risen from £1,176,552 at the close of 1895, to £1,228,866 at the close of 1806. The increase in the capital account was attributable to the charging of interest on obligations against capital. At the close of 1895 the interest thus charged stood at £84,001, while at the close of 1896 the item had expanded to £140,001. The obligation service involves a charge of £56,000 per annum, while, as has just been shown, the profit realized in 1896 was only £2,372.—*Transport.*

LOCOMOTIVE BUILDING.

The Iowa Central will soon order ten 10-wheel and two switching locomotives.

The Baldwin Locomotive Works has received an order for four locomotives for the Island of Formosa.

The Climax Mfg. Co., of Corry, Pa., has received an order for four geared locomotives from the Colorado & Northern Railroad.

The Baldwin Locomotive Works have received an order to build three more Vauclain compound locomotives for the Canadian Pacific, making 13 in all.

We understand that the order of the Chicago, Milwaukee & St. Paul for eight locomotives with the Baldwin Locomotive Works has been increased to 20.

The Rio Grande Western has placed an order with the Baldwin Locomotive Works for four 10-wheel passenger engines. They will have 19×26 in. cylinders and 67-in. drivers.

In our last issue we stated that the Kansas City, Pittsburgh & Gulf is asking bids on 30 locomotives. This is an error and unfortunately crept into our columns in that form instead of as a denial, as we intended.

The Terminal Railroad Association of St. Louis has ordered two six-wheel switching locomotives from the Baldwin Locomotive Works. These engines will have cylinders 19 × 24 in., a wheelbase of 11 ft. 6 in., and weigh in working order 106,000 lbs.

At a meeting of the stockholders of the Nippon Railway, the largest private railroad in Japan, last month, it was decided to buy 500 more locomotives. We are informed that American builders stand a good chance of getting a large part, if not all, of the order.

The Baldwin Locomotive Works shipped 20 locomotives for the Imperial Government Railways of Japan on the steamer Hanseat, which sailed from New York September 22. Ten will go to Kobe and the rest to Yokohama. These engines have already been described in the *Railroad Gazette.*

The Brooks Locomotive Works, of Dunkirk, N. Y., are building two narrow-gage mogul locomotives for the Jalapa & Cordova Railroad, of Mexico. They will have 14 × 20 in. cylinders, straight top, radial-stayed boilers, 52 in. in diameter, and 84 × 24 in. fireboxes. They will be fitted to burn wood.

The Richmond Locomotive & Machine Works, of Richmond, Va., has received an order to build five compound consolidation engines for the South Carolina & Georgia Railroad. They will have 23×35×26 in. cylinders and weigh in working order approximately 152,000 lbs. with 135,000 lbs. on the drivers. They will be equipped with Westinghouse-American air-brakes, magnesia boiler covering, Latrobe tires, Trojan couplers, Star 18-in. round headlights, Sellers injectors, Nathan lubricators, Leach sanding apparatus and McKee-Fuller engine truck wheels.

Two of our contemporaries state that the Dickson Locomotive Works, of Scranton, Pa., have received an order through the New York Equipment Co., for two American type passenger engines for the Mexican Southeastern Railroad. This is denied by the locomotive company. The same papers also speak of the sale of some locomotives, built by the Baldwin Locomotive Works, to the Jerome Park Reservoir of New York City and the Erie & Central New York Railroad. While the statements do not clearly state that these are new locomotives, they are misleading and the Baldwin Locomotive Works deny that they have received any such orders.

CAR BUILDING.

The Norfolk & Western has under consideration the building of a number of cars.

The Chicago, Burlington & Quincy is building at its Aurora shops 200 double-deck sheep cars.

The Michigan-Peninsular Car Co. is building 100 freight cars for the Pittsburgh & Lake Erie.

We understand that the Delaware & Hudson Canal Co. will soon be in the market for some new cars.

The Iowa Central is in the market for cars, and it is expected that the number ordered will be 100 or 200.

The Michigan-Peninsular Car Co. is building 200 freight cars for the Consolidated Rolling Stock Co., of Bridgeport, Conn.

The Cincinnati, New Orleans & Texas Pacific is reported as having placed an order for 100 stock and 100 box cars with the Ohio Falls Car Mfg. Co., of Jeffersonville, Ind.

The Pittsburgh, Cincinnati, Chicago & St. Louis has finished an order of five combination cars at the Columbus car shops, and another order is out for three new baggage cars.

The Philadelphia & Reading has finished building 400 twin King hopper coal cars at its Reading shops, and it is stated that 200 more cars of the same pattern will be built at Reading.

It is stated that the Rodger Ballast Car Co., of Chicago, is having 50 ballast and two plow cars built at the works of the Wells & French Co. for the St. Louis & San Francisco Railroad.

The Chicago, Burlington & Quincy has ordered 1,000 box cars from the Wells & French Co., of Chicago. These cars are to be of 60,000 lbs. capacity, 34 ft. long and equipped with Westinghouse air-brakes and McCord journal boxes and Chicago roofs. The railroad company will furnish the drawbars.

The St. Charles Car Co. has received a contract to build one private car, two first-class coaches, two third-class coaches, two combination passenger and express cars, six box cars and six flat cars for the Jalapa & Cordova Railroad of Mexico. No special equipment has been specified on these cars.

The Ohio Falls Car Mfg. Co., of Jeffersonville, Ind., is building 100 stock and 100 ventilated box cars for the Queen & Crescent. They will be equipped with Buckeye steel trucks, Winslow roofs, Q & C doors and M. C. B. standard cast-iron journal boxes. The railroad company will supply the couplers and brakebeams.

In our last issue we noted an order of the Chesapeake & Ohio for 1,000 cars placed with Pullman's Palace Car Co., and stated that Tower couplers would be used on the cars. We are now informed that the specifications have been changed and that Janney couplers, made by the McConway & Torley Co., of Pittsburgh, are to be substituted for the Tower.

The Columbus, Hocking Valley & Toledo is building two sample gondola cars, preparatory to placing an order for a large number of the same pattern as soon as the receivership terminates, which it is thought will be before the end of the year. It is stated that the cars will have the Bettendorf bolsters, Buckeye couplers and continuous draft rigging.

The stockholders of the Nippon Railway of Japan met last month and decided to increase the rolling stock of the road by adding 1,536 passenger and 5,300 freight cars. As all of the car works in Japan have sufficient orders to keep their shops running to their full capacities for some time to come, the road will have to go outside of Japan for these cars. We are informed that American car builders are in a position to get considerable if not all the business.

Week before last we noted the placing of an order by the Cleveland, Cincinnati, Chicago & St. Louis with Pullman's Palace Car Co. for 1,000 box cars. These will be 36 ft. long, of 60,000 lbs. capacity, and will be equipped with Chicago corrugated galvanized iron roofing, Janney couplers, National hollow brake beams, Q & C outside door fasteners, Chicago grain doors, Westinghouse latest improved air-brakes, Cleveland City Forge & Iron Co.'s turnbuckles, Morris steel box lids and malleable iron buffer-blocks, recommended by the M. C. B. Assn. The cars will be painted with Sherwin-Williams Co. standard freight-car paint.

The Southern Railway has placed orders for the following cars: Ten vestibuled passenger cars, Pullman's Palace Car Co.; six vestibuled express cars, 60 ft. long with six-wheeled trucks, Barney & Smith Car Co., Dayton, O.; four combination passenger and baggage cars, 65 ft. long and 300 ventilated box cars and 200 box cars with the Ohio Falls Car Mfg. Co., Jeffersonville, Ind. The box cars will be equipped with Forsyth couplers, Westinghouse air-brakes, Sterlingworth brake beams and part Hutchins and part Chicago roofs; 250 coal cars, Lenoir Car Co., Lenoir, Tenn. (this order will probably be made 500); 100 refrigerator cars to the Illinois Car & Equipment Co., whose works are at Anniston, Ala., and 50 flat and 50 stock cars to the Elliot Car Co., of Gadsden, Ala. All of the freight cars will be of 60,000 lbs. capacity.

BRIDGE BUILDING.

Carlisle, Pa.—The Grand Jury has recommended the building of the joint bridge at Bowmansdale by the Commissioners of Cumberland and York counties.

Chicago, Ill.—Plans and specifications for the sub- and superstructures of several bridges to be built across the drainage canal may be obtained at the office of the Chief Engineer, Room 1010, Security Building, on or after Oct. 13. Thomas Kelly, President Board of Trustees.

The City Engineer has been ordered to make plans for a new rolling bascule bridge at State street; estimated cost, $100,000.

The bids for building the substructure of a bridge for the Chicago, Madison & Northern, near the east end of Section N of the drainage channel, ranged from $40,045 to $62,862, McArthur Bros.' Co. and Winston & Co. being the lowest bidders. The same companies were also the lowest bidders for the substructures of three other bridges to be built over the same channel, their bids being, for Atchison, Topeka & Santa Fe bridge at west end of Section N, $22,967; for another bridge for the same road near the east end of Section G, $27,468, and for bridge for the Chicago & Calumet Terminal, $17,192.

Clearfield, Pa.—The Grand Jury has recommended a new county bridge over Comfort Run in Jordan Township.

Columbus, O.—Bids are asked Oct. 1 for the sub- and superstructures and approaches of a bridge over Big Walnut Creek, near Central College, bridge to have through span of 144 ft. and be 21 ft. 6 in. wide. W. H. Halliday, County Auditor.

Easton, Pa.—The Grand Jury has recommended a county bridge over Le Fevre Creek, in Plainfield Township.

Fulton, N. Y.—State Superintendent of Public Works Geo. W. Aldridge is asking for bids Sept. 28 for a bridge over the Oswego Canal at First and Oneida streets, this place.

Grand Forks, B. C.—Two new bridges are to be built in this vicinity this fall.

Greensburg, Pa.—On Sept. 18 the County Commissioners decided to build a new iron bridge across Brush Creek, on the road leading from Penn to Brush Creek cemetery.

Indianapolis, Ind.—Bids are asked Sept. 29 for five plate girder bridges. M. A. Downing, Chairman Board of Public Works.

Japan.—J. A. L. Waddell, Keith & Perry Building, Kansas City, Mo., has received a contract for building eight bridges on the line of the Nippon Railway of Japan. The bridges vary from 300 to 500 ft. in length.

Lewisburg, Pa.—At a recent meeting of the Town Council it was decided to build a bridge on the extension of Third street, near Brown.

Lindsay, Ont.—The Ontario government has decided to rebuild the Baskilonge bridge. The estimated cost of the work is $1,200.

Middletown, O.—Plans are being made for a bridge to be built over the canal at Third street. Estimated cost, $6,000.

Moundsville, W. Va.—Bids are asked Sept. 28 for a 180 ft. span steel highway bridge, with two shore spans 30 ft. each and roadway 14 ft., to be built over Fish Creek at Fort Shepherd. E. M. Lewis, County Clerk.

New Kensington, Pa.—A charter has been granted to M. D. Wayman and others as the New Kensington Bridge Co., to build a bridge over the Allegheny River, from the foot of Ninth street, New Kensington, to Bouquet station.

New York.—Bids were opened by the Commissioner of Public Works Sept. 16 for the new bridge across the Harlem River at Willis avenue. Leonard Foley & Co., of Philadelphia, were the lowest bidders, their figure being $1,026,684.

On Wednesday, Sept. 22, the Commissioners of the New East River Bridge opened bids for the construction of the New York and Brooklyn anchorages as follows:

NEW YORK ANCHORAGE.
Bids per foot of pile.

	Not exceeding 20 ft. below cut-off.	20 to 30 ft.	30 to 40 ft.	40 ft. and more below cut-off.	Remainder of work complete in place.
Messrs. Hoge & Co..	8	9	10	12	920,000
Thos. Dwyer.....	10	11	12	14	937,000
B Gallagher	8	9.50	11	13	965,000
John C. Rogers.....	15	20	25	30	933,000
Degnon & McLean Cons. Co.	3 50	5.50	10.80	12	773,850
P. H. Flynn.....	7	9	15	18	904,000
John J. O'Brien & Co.....	4	6	12	15	729,875
Jutte & Foley.....	8	12	16	10	1,156,135
Stephens & O'Rourke...	8	10.50	13	15	1,210,000
M. J. Dady	25	30	40	50	857,733
F. & A. Walsh.....	5	7.50	10	12.50	938,700
Arthur McMullen & Co.	6	7	8	12.50	787,000
P. J. Carlan Co	9.5	10.75	11.75	16	895,787
Shenley & Ryan.....	10	12	16	20	716,770

BROOKLYN ANCHORAGE.	Lump sum of work complete in place, exclusive of piles, as on New York anchorage.
Bernard Gallagher.....	$925,000
Jutte & Foley.....	1,897,822
J. C. Rogers.....	875,000
John J. Cashman	977,000
Joseph Hendler.....	724,000
Charles Hart.....	958,574
M. J. Dady.....	813,362
Stephens & O'Rourke.....	1,190,000
P. J. Carlan Co.....	874,000
John J. O'Brien & Co	687 621
Degnon & McLean Construction Co.....	721,850
P. H. Flynn.....	899,649
John McNamee.....	1,060,000
Arthur McMullen & Co.....	793,000

Norristown, Pa.—Viewers have recommended a steel and stone bridge with a span of 177 ft. and 40 ft. in width over Sawmill Run, from Green to Arch streets, at a cost of about $17,000.

Titusville, Pa.—The Grand Jury has recommended a county bridge across Snodgrass Run, in West Shenango township.

Woodstock, N. B.—Tenders are asked by the Chief Commissioner of Lands and Works for a bridge over Bull's Creek, with stone piers and iron superstructure.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chicago & Northwestern, quarterly, preferred 1¾ per cent., payable Oct. 8.

Georgia Southern & Florida. 1st preferred 5 per cent., 2d preferred 2 per cent., payable Nov. 1.

Maine Central, quarterly, 1½ per cent.; payable Oct. 1.

New York Central & Hudson River, quarterly, 1 per cent., payable Oct. 15.

United New Jersey Railroad & Canal, quarterly, guaranteed, 2½ per cent., payable Oct. 11.

Capital Traction (Washington, D. C.), 65 cents, payable Oct. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Chesapeake & Ohio, annual, for election of directors and other business, Richmond, Va., Oct. 19.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Association of General Baggage Agents* will hold its seventeenth annual convention at Brown's Palace Hotel, Denver, Col., on Oct. 13.

The *American Railway Association* will hold its next meeting at the Holland House, New York, on Oct. 6.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *American Street Railway Association* will hold its sixteenth annual convention in Convention Hall, Niagara Falls, Oct. 19-22, 1897.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Association of Railway Superintendents of Bridges and Buildings* will hold its seventh annual convention at the Brown Palace Hotel, Denver, Col., beginning Oct. 19, 1897.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineers' Club of Columbus*, (O.), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736 1739 Monadnock Block, Chicago.

The Engineers' Club of Philadelphia.

The first regular fall meeting of this club was held on Saturday, Sept. 18. The paper of the evening was "The Delaware River Bridge at Easton, Pa.," by Prof. J. M. Porter. The paper was illustrated. Lunch was served after the meeting.

The Civil Engineers' Club of Cleveland.

At the regular meeting of the club, Sept. 14, Messrs. Charles Warren Comstock and John William Easton were elected to active membership. The paper of the evening was by Mr. William H. Searles on "The Consulting Engineer in Municipal affairs." The point brought out in this was the importance to a large city of having such an officer permanently engaged, rather than to depend upon a temporary commission of engineers from a distance called to act at long intervals of time. An interesting discussion followed.

New York Railroad Club.

A regular meeting of this club was held in the rooms of the American Society of Mechanical Engineers, at 12 West Thirty-first street, New York City, on Sept. 16, at which there was a topical discussion on the subject of "Lubrication." Subsequent regular meetings will be held at the usual time and place as heretofore on the third Thursday of each month, and members are reminded that no further formal notice of such meeting will be given. Advance copies of formal papers will be sent to members' addresses as heretofore.

The Western Society of Engineers.

A large party of members of the Western Society of Engineers and of their friends left Chicago Wednesday evening at 6 p. m. on a special train of Pullman sleepers over the Grand Trunk Railway. The programme was to spend Thursday at Niagara Falls, Friday at Bethlehem and Phillipsburgh and to reach New York about 10 o'clock Saturday morning. The party will stay in New York until after midnight Saturday night, when the return trip by the way of Niagara Falls will begin, and Chicago will be reached Monday morning. Many courtesies have been offered, and it is expected that the excursion will be very busy and enjoyable.

Engineers' Club of St. Louis.

At the regular meeting of this club, held Sept. 15, 17 members and two visitors were present. The minutes of previous meetings were read and approved. The Executive Committee reported an offer for a duplicate set of 21 volumes of the Transactions of the American Society of Civil Engineers, which was accepted. Mr. Charles W. Hawkes and Mr. Henry Branch were proposed for membership. The Secretary read a communication from the Western Society of Engineers inviting the Engineers' Club of St. Louis to take part in its excursion to Niagara and Philadelphia. Mr. S. Bent Russell then gave an informal talk on repairs which had been done on the conduit and settling basins of the water-works. Cracks had appeared, due to settlement and temperature changes, and the methods which had been adopted for repairing these cracks were illustrated. Lantern slides showing the construction of the conduit and basins were exhibited. In the discussion which followed Mr. Crosby described the methods which had been employed for measuring the distortion of the arch in the Sudberry conduit. The President then exhibited some lantern slides showing the launching of the new dredge boat Zeta, after which lunch was served.

American Association of General Passenger and Ticket Agents.

The forty-second annual meeting of this association will be held at the Southern Hotel, St Louis, Mo., on Tuesday, Oct. 19. The subjects to be considered are as follows:

The report of the committee on the question of safety paper for use in printing inter-line tickets. This question is the most important one this association has ever been called upon to decide. Certain facts connected with it will be presented, which may be so far-reaching in final results, if assented to by the members, as to justify the attendance of a representative of every transportation line on this continent, who are issuing or who expect to issue inter-line tickets, so that they may become possessed of such facts as may be presented by the discussion. The vast importance of complete working rules and regulations for the effective use of safety paper cannot be over-estimated, and recent experiences call for remedies that should be applied without delay.

The committee appointed at last meeting to suggest a uniform plan for handling correction sheets against foreign lines will make a report. The committee consists of Messrs. Haile, Atmore and Martin.

The Executive Committee will report upon the revised list of honorary members, necessary under the new By-Laws, also upon the subject of the control of inter-line tickets, and upon the question of uniform contracts on inter-line tickets.

The following subjects have been suggested for discussion: 1. The interchangeable mileage ticket of the Central Passenger Association. 2. The necessity for uniform safety paper for coupon tickets. 3. Excursion business in all its details. 4. Some rule to prevent the fraudulent use of tickets. 5. Uniformity of state laws relative to the handling of passengers and baggage and rates therefor. 6. Uniformity in the rules of railroad companies in handling passenger business and baggage. 7. What are the benefits derived from passenger traffic associations? 8. The entire abolishment of skeleton tickets

Mr. P. S. Eustis will deliver the annual address. It is expected that others will also address the association on subjects of practical importance.

The Pennsylvania Railroad and the Pennsylvania Company will run a special train, leaving New York on the evening of Oct. 17.

The annual meeting of the Traveling Passenger Agents' Association will be held at Nashville Oct. 12.

RAILROAD LAW—RECENT DECISIONS.

In New Jersey where an electric railroad crosses the track of a steam railroad a train operated by the steam railroad has the right of way. But those engaged in the operation of the train are bound to ring its bell and blow its whistle at the crossing in the manner required by statute, and if they do so the steam railroad company is entitled to recover damages against the electric railroad company for injury sustained by a collision arising from the negligent operation of one of the electric cars. It is such negligence for the person in charge of the car not to exercise the same degree of care as is required of any one driving an ordinary vehicle over a railroad crossing (decided in the Sup. Ct., June, 1897).[1]

In Nebraska it is held, in an action against a railroad company to recover damages resulting from the failure of its servants to ring or whistle at a public crossing, that the omission of the company to give such signals is not *per se* negligence, although it is required by statute to do so (decided in the Sup. Ct., June, 1897).[2] The weight of authority throughout the United States leaves such a failure open to explanation and excuse.

In New Jersey a railroad company used its freight yard almost exclusively for the purpose of carrying on a private coal business, using coal from its own mines, carried on its own cars to the yard, and sold through its own agents, in its own name and upon its own account. It is held that railroad property so used is not exempted from local taxation by the statute which exempts property used for railroad purposes from such taxation, and provides that the tax upon such property shall be paid to the state. The fact that the property is owned by a railroad company is not at all conclusive as to its character, for purposes of taxation. The test is the purpose for which it is held, or the use to which it is actually devoted (decided in the Sup. Ct., is June, 1897).[3]

In New Jersey it is held that a contract to indemnify a railroad company against losses arising from an injury to or death of a passenger carried by it is not invalid as against public policy, although it covers losses resulting from the carrier's negligence (decided in the Sup. Ct. June, 1897).[4] The course of reasoning by which the Court reaches this conclusion is mainly that since it cannot be assumed that a corporation, solely in consequence of having an indemnity for injury to passengers, will necessarily be less careful in the performance of its duty to them, and since the indemnity in no way affects the liability of the carrier to the person injured, such an indemnity is in no way repugnant to public policy.

In Rhode Island the engineer of an engine running light, who by violation of orders causes a collision, is a fellow servant of a brakeman on the train collided with. It is held, in such a case, that the brakeman assumed the risk of injury from the negligence of the engineer when he accepted employment from the railroad company in whose employ they both were, and therefore could not recover damages for the injury (decided in the Sup. Ct., June, 1897).[5]

In Connecticut, in an action against a street railroad company for running over a child, a witness will not be allowed to testify to a declaration of the child's mother, after the accident, that she did not blame the motorman. Such a declaration has no relevancy to the case (decided in the Sup. Ct., June, 1897).[6]

In New Jersey, escape of electricity from a street railroad, by reason of defective bonding, is in itself sufficient proof of negligence in the operation of the railroad to support a verdict in favor of one injured thereby, where the negligence of the plaintiff does not contribute to the injury, and where no proof is offered of a latent defect in the bonding, accounting for the escape, of which the managers of the railroad could not, with due diligence, have learned. The plaintiff is only bound to prove that the electricity escaped (decided in the Court of Errors, June, 1897).[7]

In New Jersey the Chancellor cannot impose upon a steam railroad company, whose track is to be crossed by an electric road, the duty and responsibility of operating a derailing switch in the line of the electric railroad, by virtue of the authority vested in him by the statute which provides that where an electric railroad is about to cross a steam railroad the Chancellor shall define the mode in which the crossing shall be made, and that the crossing shall be made in the manner defined by him and not otherwise (decided in the Court of Errors, June, 1897, four judges dissenting).[8]

In Minnesota a passenger purchased a mileage ticket from the agent of a railroad company. The ticket was, by the mistake of the agent, punched on the margin to expire on the day it was issued, instead of a year later. The passenger signed a contract whereby he agreed that the ticket should be "void for passage after the date punched in the margin." He offered this ticket for his fare, and it was refused. Upon his refusal to pay other fare he was ejected from the train by the conductor. It is held that on this state of facts he was entitled to recover damages from the railroad company, and that, although a passenger cannot ordinarily increase the amount of his recovery by refusing to leave the train, and thereby compelling the conductor to expel him by force, the conductor should, under the circumstances, have investigated further before ejecting him, and that by reason of his failure to do so the rule as to damages did not apply (decided in the Sup. Ct., June, 1897).[9]

In Minnesota, the St. P. M. & M., under legislative authority, leased a part of its road to the Great Northern, granting to the latter company the exclusive control and possession of the road so leased. The G. N., also under legislative authority, granted to the Eastern the right to run its trains over the part of the road leased to it: the G. N., however, retaining possession and control of the road. The G. N. negligently permitted to accumulate and remain on the right of way combustible material which was likely to be ignited by sparks from passing engines. The Eastern negligently operated an engine so that fire escaped from it, and ignited the combustible material on the right of way and property on the premises of adjacent landowners was destroyed thereby. It is held that the St. P., M. & M. was not liable for the negligence of either the G. N. or the Eastern, since the legistative authority to lease the road included, by implication, exemption from liability for the negligence of the lessee in operating the road But the G. N., which retained control and possession of the road, was liable for the negligence of the Eastern in the operation of its train. Authority to grant to another company the privilege of running its trains over a road, where the granting company retains control and possession of the road, does not include by implication exemption from liability for the negligence of the company to which the privilege is granted, and even if the G. N. was not liable for the negligence of the Eastern it would nevertheless be liable for its negligence in permitting combustible material to remain on the right of way (decided by the Sup. Ct., June, 1897).[10]

The Texas court follows the rule of the last foregoing case, so far as it decides the question arising in a case in that court, by holding a railroad company liable to damages resulting from its negligence in allowing combustible matter to be on its right of way so as to be ignited by sparks from an engine, even though the engine is in as good condition as the law requires and properly handled (decided in the Court of Appeals, May. 1897).[11]

In Nebraska, where damage is claimed against a railroad company by reason of the escape of fire from a locomotive the company must show that the engine was properly constructed, equipped and operated (decided in the Sup. Ct., June, 1897).[12] The doctrine asserted in the three last foregoing cases is supported by a decided weight of authority in most of the other jurisdictions throughout the United States.

In Wisconsin, one injured while attempting to get on a freight car to seal it cannot recover damages against a railroad company by virtue of the statute which allows a recovery by an employee engaged in "operating, running, riding upon, or switching" trains or cars, who is injured by the negligence of another employee in the performance of his duties (decided in the Sup. Ct., June, 1897).[13] It is to be observed that the statute here referred to materially modifies the law governing the liability of a company for injuries sustained by an employee by reason of the negligent act of a fellow-servant.

In Michigan, where the common convenience of the public and a railroad company requires that an opening should be left in a fence along the company's track, the company is not liable for the killing of cattle which stray upon the track through the opening (decided in the Sup. Ct., June, 1897).[14]

In Wisconsin a railroad company is bound to construct its railroad embankment in such a manner as to withstand water which may accumulate against it in any ordinary storm, and it will be liable to a proprietor of lower ground for all damages sustained by him from the breaking of its roadbed, caused thereby (decided in the Sup. Ct., June, 1897).[15]

In Nebraska a contract to carry freight, which contains no specified time for performance, implies performance within a reasonable time, and an action may be maintained for unreasonable delay. For example, where under such a contract a railroad company received cattle for transportation on March 31, the usual time required for transportation being not more than 36 hours, the failure of the company to deliver them at their destination before the following April 4 is held to be such an unreasonable delay (decided in the Sup. Ct., June, 1897).[16]

In Texas it is held that a person could not recover for injuries sustained on a freight train, though the conductor had invited him to ride thereon, if he knew that the company had a rule prohibiting the carriage of passengers on freight trains, and that it was actually trying to enforce such rule (decided in the Court of Appeals, April, 1897.)[17]

In Texas a railroad company dug a trench on its right of way whereby a pool of water was formed which was dangerous to no one but very young children. A child less than three years old fell into the pool and was drowned. The parents were not guilty of any negligence in the care of their child. It is held that they could not recover damages for the loss of the child (decided in the Court of Appeals, November, 1896).[18]

[1] N. Y. & G. L. v. N. J. El., 37 Atl. Rep., 627.
[2] C., St. P., M. & O. v. Brady, 71 N. W., 721.
[3] D., L. & W. v. Mayor, etc., of Newark, 37 Atl. Rep., 629.
[4] Trenton Pass. Ry. v. Guarantor's, etc., Co., 37 Atl. Rep., 609.
[5] Healey v. N. Y., N. H. & H., 37 Atl. Rep., 676.
[6] Budd v. Meriden El., 37 Atl. Rep., 783.
[7] Trenton Pass. Ry. v. Cooper, 37 Atl. Rep., 730.
[8] N. Y. & L. B. et al., v. Atlantic Highlands, R. B. & L. B. El. Ry. Co. et. al., 37 Atl. Rep., 736.
[9] Kreuger v. C., St. P., M. & O., 71 N. W., 683.
[10] Heron v. St. P., M. & M., et al., 71 N. W., 706.
[11] I. & G. N. v. Newman, 40 S. W., 854.
[12] Rogers v. Kan. City & O., 71 N. W., 977.
[13] Hibbard v. C., St. P., M. & O., 71 N. W., 807.
[14] McDonald v. Minn., St. P. & S. St. M., 71 N. W., 859.
[15] Borchsenius v. C., St. P., M. & O., 71 N. W., 884.
[16] Denman v. C., B. & Q., 71 N. W., 967.
[17] San Antonio & A. P. v. Lynch et al., 40 S. W., 631.
[18] M., K. & T. v. Dobbins, 40 S. W., 861.

PERSONAL.

—Mr. C. L. Strobel, Consulting Bridge Engineer, Chicago, has returned from an extended European trip.

—Col. Edward McGovern, a prominent lawyer of Lancaster, Pa., died at his home Sept. 20 at 62 years of age. He had been closely identified in the building of several roads in New Mexico and the United States, including portions of the Reading & Columbia and the Denver & Rio Grande.

—Mr. Y. Kunisawa, Engineer of Maintenance of Way of the Nippon Railway, of Japan, arrived here from England last week. He will make a study of the construction of several of the large roads in the United States and will also visit some of the makers of track materials. He will sail from Vancouver for Japan Oct. 11.

—Mr. B. W. Thacher, whose death took place at the City of Mexico, Sept. 13, has been the General Freight and Passenger Agent of the Mexican National since 1889. He was born Dec 18, 1847, and entered railroad service in 1871 with the New York & Oswego Midland as Clerk to the Treasurer. Three years later he became General Freight Agent of the same road and in 1875 its General Passenger Agent. In 1881 he entered service with the Mexican National as Cashier and Auditor and continued in the service of that road until his death.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—F. B. Houghton, Chief Clerk in the general freight department at Chicago, has been appointed General Agent at El Paso, Tex. He will be succeeded by E. F. Lalk.

Atlanta & West Point.—At the annual meeting of the stockholders, held at Atlanta, Ga., Sept. 14, the old Board of Directors was re elected with the exception of T. L. Langston, who was succeeded by J. M. Egan, of Savannah, Ga., Vice-President of the Central Railroad of Georgia.

Central of Georgia.—J. W. Nall has been appointed General Agent, with headquarters at Augusta, Ga., to succeed E. T. Charlton, who has been appointed General Eastern Agent of the Ocean Steamship Co., with headquarters at New York City.

Chattanooga, Rome & Southern.—This company, which succeeds the old Chattanooga, Rome & Columbus (see these columns for July 16) has been reorganized with the following officers: President, C. B. Wilburn; Auditor, W. M. Darby; Roadmaster, Alex. Bonnyman; Foreman Shops, M. J. Connelly, Chattanooga; Secretary and Cashier, W. E. Huff; Dispatcher, J. C. O'Dell; Commercial Agent, C. S. Pruden. The headquarters of the company are at Rome, Ga.

Chicago & Northwestern.—Peter Hallenbeck, heretofore Superintendent of the Iowa Division, has been appointed Division Freight Agent, with headquarters at Des Moines, Iowa, taking effect Oct. 1. He is to be succeeded by Richard Aishton, now Superintendent of the Northern Iowa Division, which division is to be under the charge of William D. Hodge, for 10 years engineer of the division.

Chicago, Indianapolis & Louisville.—At the annual meeting of the stockholders, held at Indianapolis, Sept. 15, Directors were elected and classified as follows: For four years, Samuel Thomas, Calvin Brice and John G. Moore, New York; William H. McDoel, Chicago. For two years, Gilbert R. Shaw, Chicago; James Murdock, Lafayette, Ind; Volney T Mallott, Indianapolis. For one year, Crawford T. Fairbanks, Terre Haute, Ind.; John Hilton, New York.

Chicago, Milwaukee & St. Paul.—At the annual meeting, held in Milwaukee Sept. 18, Charles W. Harkness, of New York, was elected a director to succeed R. Vansantvoord.

Chicago, Rock Island & Pacific.—A. Dallas, General Foreman at Herington, Kan., has been transferred to Goodland, Kan., to succeed A. McCormick, who has resigned to enter other business.

Cleveland, Cincinnati, Chicago & St. Louis.—R. L. Ettinger has been appointed Mechanical Engineer, with headquarters at Indianapolis, Ind., to succeed Mason Rickert, promoted.

Cleveland, Lorain & Wheeling.—William A. Wood, for several years assistant to E. W. Terry, General Freight Agent at Cincinnati, has been advanced to the position of General Freight Agent to succeed Mr. Terry, resigned.

Fitchburg.—John Gourley has been appointed Division Freight Agent of the main line and branches from Boston to Falls River, Vt., under the direction of General Freight Agent A. S. Crane, of Boston.

Georgia.—S. E. McGill has been appointed Contracting Freight Agent, with headquarters at Macon, Ga., to succeed H. R. Jackson.

Grand Trunk.—A. Waldebauer, of Saginaw, Mich., for a number of years in the employ of this company, has been appointed Traveling Passenger Agent under the direction of District Agent J. D. McDonald, at Buffalo, N. Y.

Illinois Central.—At the annual meeting of stockholders, held at Chicago, Sept. 15, B. F. Ayer, Walter Luttgen and John W. Achincloss were re-elected directors for four years.

Kansas City, Fort Scott & Memphis.—J. L. Rogers, formerly Contracting Freight Agent, has been appointed Commercial Agent, with headquarters at Kansas City, Mo., to succeed C. B. Holcombe, resigned.

Kansas City, Pittsburgh & Gulf.—C. J. Snook has been appointed Commercial Agent, with headquarters at Texarkana, Tex. S. D. Talbott, of Chicago, formerly Western Freight Agent for the Furniss line of steamers, has been appointed General Foreign Freight Agent, with headquarters at Kansas City, Mo.

Leavenworth, Kansas & Western.—This directors of this company, organized to take the place of the old Kansas Central, as stated in another column, are as follows: P. Clancey Anderson, G. F. Warren and A. Krech, New York; A. L. Williams, N. H. Loomis, R. W. Blair and H. F. Williams, Topeka, Kan.

Lehigh Valley.—The office of A. W. Moonenacher, Assistant to the General Passenger Agent, will be removed from South Bethlehem, Pa., to Philadelphia Oct. 1

Louisville, Evansville & St. Louis.—J. R. Capp has been appointed Traveling Passenger Agent in charge of the territory west of the Mississippi, with headquarters at Kansas City, Mo.

Mexican National.—W. B. Ryan has been appointed General Freight and Passenger Agent, with headquarters at the City of Mexico, to succeed B. W. Thacher, deceased.

Missouri, Kansas & Texas.—E. H. Coombs has been appointed Contracting Agent, with headquarters at Galveston, Tex.

Missouri Pacific.—John S. Thurman has been appointed Mechanical Engineer, with office at St. Louis, Mo.

Norfolk & Western.—H. H. S. Handy, for some time Superintendent of the Winston-Salem Division, with headquarters at Winston-Salem, N. C., has been appointed General Freight Agent, with headquarters at Norfolk, Va. This division is to be merged with the Shenandoah under the direction of Superintendent J. W. Cook, of Shenandoah, Va.

Oregon Short Line.—A. MacCorquodale has been appointed Contracting Freight Agent under General Agent W. E. Coleman, with headquarters at Portland, Ore.

Peoria & Pekin Union.—Charles D. Moyer, who represented the Chicago, Peoria & St. Louis on the directorate of this road, resigned Sept. 14, and Henry W. Gays, of Springfield, Ill., was elected his successor.

Portland & Rumford Falls.—The annual meeting of stockholders, held in Portland, Me., Sept. 14, re-

sulted in the re-election of the old Board of Directors and officers. Additional Directors elected are: Payson Tucker, F. C. Bradford, Portland, Me.; George N. Fletcher, Detroit, Mich., and Charles D. Brown, Boston.

Rio Grande Western.—E. J. Yard, for years at the head of the engineering department, with the title of Resident Engineer, at Salt Lake City, Utah, has been given the title of Chief Engineer, with headquarters in the same city.

St. Louis & San Francisco.—Clarence Russell has been appointed Contracting Freight Agent, with headquarters at Pittsburgh, Pa.

St. Louis, Peoria & Northern—Robert Adams has been appointed Auditor, with office at St. Louis, Mo., to take effect Oct. 16.

Washburn, Bayfield & Iron River.—At the annual meeting, held at Ashland, Wis., Sept. 9, the following Directors were elected: Isaac Wing, William Knight, George H. Quayle, W. E. McCord, John A Jacobs, D. M. Maxcy, Gilbert Olson, William Olson, P. J. Peterson, Howard Benton and L W. Clark. At a subsequent meeting the following officers were elected: President, Isaac Wing, Bayfield, Wis; Vice-President, Howard Benton, Washburn, Wis; Secretary, John A. Jacobs, Washburn; Treasurer, D. M. Maxcy, Washburn.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

American Pacific.—This company was incorporated in Kansas, Sept. 15, to build a system of roads from Savannah, Ga., and Jacksonville, Fla., west through Georgia, Alabama, Louisiana, Texas, New Mexico and Arizona to San Diego, Cal., with a north and south branch from Velasco, Tex., north through Indian Territory, Kansas, Nebraska and South Dakota to the Canadian line in North Dakota. Another line is projected through Texas into Mexico ending at Topolambampo Bay. The Directors are: C. R. Knichen, Breckenridge, Tex.; J. C. Jones, Crystal Falls, Tex.; Peter Swansen, Caddo, Tex; W. H. Spraut and B. L. Filley, Honduras; W. B. Hunter, Riverside, Cal.; R. B. Hunter, S. N. Keim and Hattie J. Kirkwood, Franklin County, Kan. It is stated that this company is organized by Texas and Kansas socialists and that they propose to build the road by issuing mileage books or certificates good at the company's office as payment for carrying freight. The charter provides that no indebtedness can be incurred and that when the United States or any state shall have acquired 60 per cent. of the stock the other 40 per cent. can be purchased by the Federal or State government.

Baltimore & Ohio.—The contract for raising the tracks at Pennsylvania avenue and Fourteenth street, Wilmington, Del., has been awarded to Stewart & Keenan. The improvement is expected to cost over $15,000, and the contract calls for its completion by Nov. 1.

Canadian Pacific.—Tracklaying has begun on the Crow's Nest Pass extension beginning at McLeod and running east and is progressing at the rate of about two miles a day. This road is projected to run from Lethbridge west 330 miles to Nelson, B. C., and the first 100 miles from Lethbridge are under contract.

Colorado Valley.—By a typograpical error in this column last week one of the terminals of this road was given as San Antonio, Tex. (also the terminus of the Gulf, Colorado & Santa Fe). It should read San Angelo, Tex.

El Paso & White Oaks.—This company has been incorporated in New Mexico with a capital stock of $2,600,000 to build a line from El Paso, Tex., northeast about 150 miles to White Oaks, N. Mex. The incorporators are: W. H. Berghold, Felix Gottschalk, Cornelius Fisk, Julius M. Ferguson, all of New Mexico; James L. Bell, El Paso, Tex.; William Watson, Peter Nicol and M. W. Hoyle, of White Oaks. It is reported that C. B. Eddy, one of the promoters, will soon be in El Paso to let contracts for building.

Galveston, Brazos & Southwestern.—Surveys have been made for the entire line from Galveston west about 150 miles to Victory, Tex. The contract for the first 17 miles of grading from Galveston has been let and five miles completed. The company will have a number of Howe truss bridges to let, including three drawbridges. The tracklaying and smaller bridge building will be done by the company, which will soon be in the market for various railroad supplies. L. P. Featherstone is General Manager and L. E. Beadle Chief Engineer, both of Galveston.

Gulf & Interstate.—This company has been organized in Texas to build a line from Beaumont, Tex., northeast through Alexandria, La., to Vidalia, La., on the Mississippi River, opposite Natchez. A preliminary survey has been made to determine the most practical route, but locating surveys have not yet been commenced. L. P. Featherstone, Galveston, Tex., is General Manager and L. E. Beadle Chief Engineer.

Lewisburg & Buffalo Valley.—This lumber road in Union County, Pa., is now completed. The company was incorporated in Pennsylvania on May 10 to build a line 15 miles long from Lewisburg northeast to a tract of lumber land recently purchased by Monroe H. Culp & Co., in Lewisbug township.

New Roads.—U. S. Secretary of the Interior Cornelius N. Bliss has approved the bond of the St. Hilaire Lumber Co., and issued a permit to build a railroad 40 miles long across five townships on the Red Lake Reservation in Northern Minnesota. It is to cost $100,000 and will be used for an outlet for logs to mills of St. Hilaire and other points. The members of the company are F. P. Hixon, Lacrosse, Wis.; H. C. Clark and T. H. Shelbin, Minneapolis, Minn.

G. McLennitt, on Sept. 14, filed a notice with the Secretary of Arizona Territory stating his intention to build railroad lines approximating 64 miles in length in the northwestern part of the territory, the main line being from Kinman northeast about 50 miles to White Hills Camp, Ariz.

New York & Ottawa.—The New York State Railroad Commissioners have granted the application of this company to build its line from Mora, N. Y, 18 miles northwest to the St. Lawrence River. At the recent hearing the application was opposed by representatives of the New York Central & Hudson River on the ground that the proposed road would take away traffic from existing roads. This is the new company which proposes to acquire a shorter route between New York and Ottawa.

Orange, Call & Pine Belt.—This company was incorporated in Texas Sept. 7 with a capital stock of $200,000 to build a line from Orange, Tex., a point on the Southern Pacific, north through Salem and Call to Jasper, about 75 miles. The incorporators are: Dennis Call, of Orange; George Adams, George W. Smith, C. S. Hagarty, C. B. Sheppard, F. R. Siler, John Jay Culley, A. H. Mers, T. J. Trotti, William Halliday, all of Call, Tex.

Penn Yan & Pennsylvania.—This company is being organized in New York to build a line from Penn Yan, N. Y., southwest 35 miles to a point near Savona, connecting with the Rochester Division of the Erie and the Buffalo Division of the Delaware, Lackawanna & Western. The road is to be standard gage with heavy rails and bridges. The intention is to build from Savona to Wayne, 16 miles, this fall and winter, and to complete the road in the early spring. A branch is planned at Keuka to connect with a ferry on Keuka Lake to Gibson. J. D. Nares, of Corning, N. Y., is among the promoters.

Phœnix, Globe & Copper Belt.—This company has been incorporated in Arizona to build a railroad from Phœnix east about 110 miles to Globe, Ariz.

St. Louis, Peoria & Northern.—The golden spike, marking the beginning of rail laying, was driven at Springfield, Ill., by Mayor Wheeler on the afternoon of September 14. The extension runs from Springfield north through Sherman, Middletown and New Holland to Peking, about 60 miles. It is the intention to push the tracklaying fast.

Scottdale Connecting.—This company was incorporated in Pennsylvania Sept. 16 for 999 years, with a capital of $10,000, to build a road from East Scottdale, Pa., to a point on the Mt. Pleasant & Bradford Branch of the Baltimore & Ohio, at or near the village of Eberson, Fayette County. The directors are: B. F. Overholt, Scottdale, President; A. C. Overholt, John W. Ruth, J. D. Hill, of Scottdale; A. S. R. Overholt, Ralph Overholt, West Overton; A. H. Lang, Pittsburgh.

Texas Central.—This company has completed its short connecting link with the Missouri, Kansas & Texas, about eight miles above Waco, Tex. Work was begun Sept. 1 and finished Sept. 15. The new line extends from Ross, on the Texas Central, east 1.6 miles to a point north of Elm Mott. The work is rather light, the maximum grade being only one per cent. There were no bridges of any character and only one culvert. This connection gives the Texas Central another outlet, the only one heretofore being the Houston & Texas Central.

Washburn, Bayfield & Iron River.—Bracey Bros. & Co., of Chicago, have taken the contract for building this road and have over 200 men at work. The road will extend from Washburn, Wis., southwest about 26 miles to Iron River.

Washington, St. Mary's Bay & Point Lookout.—This company has been incorporated in Maryland, with a net capital of $1,250,000, to complete the building of a line from Washington, D. C., southeast to Point Lookout, Md. A portion of this distance is at present covered by the Washington & Potomac, which extends from Brandywine to Mechanicsville, 21 miles. From Brandywine it is proposed to gain an entrance into Washington over the tracks of the Pennsylvania, via Bowie Station. The section from Mechanicsville to Point Lookout, about 40 miles, was graded some years ago. It is stated that a contract has been entered into with the Pennsylvania Steel Co. for 8,800 tons of 70-lb. rails to lay this section. Among those interested is Col. A. B. Linderman, of Philadelphia, who is said to have the contract for building this extension.

Winnipeg, Duluth & Manitoba.—Premier Greenway, of Manitoba, is completing a contract with this company for its new line from Duluth, Minn., northwest to Winnipeg. (See this column for May 21.) The terms of the contract are understood to be that the new road will carry grain from Winnipeg to Duluth for seven cents per 100 lbs. and coal for $1 25 a ton with proportionately low rates on lumber and merchandise. These rates are about one-half those prevailing at present. The company asks from the government of Manitoba the guarantee of interest on $3,000,000 of bonds for 20 years. Premier Greenway says that this offer will save the Province over one million dollars annually in freight rates.

Zimmerman, Leesville & Southwestern.—This company has been incorporated to build a line from Leesville, La., northeast about 40 miles to Zimmerman, a point on the Texas & Pacific.

Electric Railroad Construction.

Amherst, Mass.—On Sept. 15 poles were erected for the East Amherst extension of the electric road.

Anderson, Ind.—Grading was begun last week on the electric road from Anderson to Alexandria. It is stated that the contracts have been let, and that the road will be pushed to an early completion.

Baltimore, Md.—The tracks of the City Passenger Railway on North Charles street are being reconstructed, and the cable conduits are being replaced by conduits for an electric road in order to avoid the necessity of again tearing up the streets should it be decided to use the electric conduit system.

Bellefontaine, O.—Papers of incorporation for an electric road from Silver Lake to Lake Ridge, in Bellefontaine, have been filed. This project has been under consideration for years. The present plan provides for a road about 20 miles in length. The incorporators include J. C. Brand, Attorney John M. Hamilton and W. W. Fisher, all of Bellefontaine.

Birmingham, Ala.—The Birmingham Traction Co. has been incorporated with a capital stock of $50,000 by George A. Clark, of Cedartown; John Londom, of Birmingham, and others.

Burlington, Vt.—The electric road which is being built near Burlington is nearly completed from Waterbury to Stowe, eight miles south of Morrisville. The new line will be 10 miles in length, to carry both passengers and freight. It is expected that it will be open by Dec. 1.

Cape Porpoise, Me.—It is stated that surveys have been completed for the Moosan River Railroad to run from Cape Purpoise to Sanford, a distance of about 20 miles. As previously noted, a dam will be built at Old Falls between Kennebunk and Sanford. This road has been partially built and repeated efforts have been made to complete the line.

Chicago.—Plans have been prepared for an addition to the power-house in Garfield Park 50×100 ft., at an estimated cost of $15,000. The architect is S. S. Beman.

College Corner, O.—Right of way has been secured by the Hamilton & Richmond Electric Railway Co. for a road from Oxford to College Corner. It is proposed to connect with the lines of the Cincinnati, Hamilton & Dayton Traction Co., when the latter road is completed.

Cripple Creek, Col.—Colorado press reports state that the Cripple Creek Short Line will soon be built, as the necessary capital stock has been secured. The Intra-Camp electric road is partially completed and other short lines are being built to the new mines in the vicinity.

Doylestown, Pa.—Plans and specifications have been decided upon and the contract for building the road has been awarded and the power-house partially built for the electric road between Doylestown and Willow Grove. It is stated that Contractor Thomas F. Delgan has agreed to complete this portion of the road within 90 days.

Greensburg, Pa.—Almost all of the rights of way has been secured for the new line between this city and Mt. Pleasant. The Greensburg, Jeannette & Pittsburgh street railroad officials are awaiting the decision of Judge Reyburn in the injunction case brought by the Pennsylvania Railroad Company before making the extension arranged for several months ago. Should the court decide against the railroad company the extension from Manor to Irwin will be pushed to rapid completion.

The Irwin-McKeesport line is hanging fire pending the sale of the rights of way, etc., now held by the George Syndicate to another company. This road was to have been constructed this summer. It is said it may be completed this fall.

The Second Avenue Company are slowly pushing their lines from McKeesport up the Monongahela and Youghiogheny valleys.

Herkimer, N. Y.—A 50-year franchise has been granted to the Little Falls & Herkimer Street Railroad Co. to build an electric road between the places mentioned in the title. The road is to be finished by 1899.

Holyoke, Mass.—The Holyoke Street Railway Co. has completed the surveys for the electric road from Willimansett to Chicopee Center, a distance of about 3½ miles. Necessary material will be purchased soon.

Hull, England.—The city corporation has asked for bids until Nov. 5 for electrical apparatus for about 9 miles of double track and half a mile of single track to be built in Hull. Specifications may be obtained from the City Engineer upon a deposit of £10, which will be refunded when the plans and papers are returned. Thomas G. Milner, City Treasurer; A. E. White is City Engineer and A. S. Barnard City Electrical Engineer.

Janesville, Wis.—E. J. Best and A. P. Lee, of the Interstate Railway Co., are said to be interested in a proposed electric road from Rockford, Ill., to Janesville, Wis.

Jeddo, Pa.—Surveys have been completed by the Lehigh Traction Co. for an extension of its line to Upper Lehigh and Eckley.

Jersey City, N. J.—The North Hudson County Railroad Co has begun to remove its elevated tracks from the end of the Hoboken elevated road at Jersey City Heights to the Court House. This portion of the road will hereafter be operated as a surface road.

Kankakee, Ill.—A franchise was granted last week for a proposed electric road 40 miles in length to be built between Kankakee, Willington and Morris, as previously referred to among our notes. Work must be begun within two years.

Lewiston, Me.—Hon. G. C. Moses, President of the reorganized Lewiston & Auburn Electric Railroad, says that there is no probability of the work being begun on the road between Brunswick and Bath this fall, but it may be taken up in the spring. As yet no definite conclusion has been reached regarding the route between these places.

New York.—Commissioner Collis, of the Department of Public Works, has written to the President of the Third Avenue Railroad Co., refusing to grant the application for a permit to lay new tracks on Amsterdam avenue, requesting him to test the legality of the refusal by mandamus proceedings. It will be remembered that the Metropolitan Traction Co. and the Third Avenue Railroad Co. have both asked for permission to build an electric conduit road on this avenue, two tracks on which are now operated by the Metropolitan Traction Co., which proposes also to change the motive power to electricity to operate the cars by the electric conduit method. The agitation thus far has not resulted in any satisfactory settlement between the companies.

Olean, N. Y.—The Common Council has granted the Olean Terminal Railway Co. the right to build an electric road on certain streets in Olean.

Palmer, Mass.—No action has been taken as yet regarding the building of the Palmer-Monson Street Railroad. The matter will be taken up at a meeting of the stockholders to be held in a short time.

Peoria, Ill.—The incorporators of the Peoria & Pekin Traction Co., which propose to build an electric road between the two cities, have elected the following officers: President, T. J. Miller; Vice-President, E. J. Darst; Secretary, A. M. Hewes; Treasurer and General Manager, L. E. Myers; General Superintendent, J. A. Brett; General Counsel, W. T. Irwin. These with the addition of A. H. Stocking, of Chicago, will make up the Board of Directors.

Philadelphia, Pa.—The Southwestern Street Railway Co., of Philadelphia, with a capital of $48,000, has been incorporated to build a six-mile line from Otsego and Mifflin streets, out Otsego and Jackson streets to Moyamensing avenue, to Penrose Ferry road, over Schuylkill River to State Island road. The Directors are: Edgar A. Tennis, Thompsontown, Pa., Treasurer; W. H. Hassenplug, Wm. J. Burns, Wm. D. Smith, Philadelphia; H. M. Van Zant, Harrisburg.

Pittsburgh, Pa.—On Sept. 8 the first cars were run over the Troy Hill & Reserve Township Street Railroad Line, which has been completed. The road is three miles in length and extends from the terminus of the Troy Hill Branch of the United Traction Company's line to the Reserve Township. The capital stock of this company is $50,000.

Saginaw, Mich.—At a meeting of the Council held Sept. 13 resolutions were adopted requesting Judge Snow to order the Union street Railway Co., to at once rebuild the tracks and roadbed on Warren avenue and other streets in Saginaw.

St. Paul, Minn.—The Assembly Committee on Streets has voted to recommend the passage of the Thompson union depot loop ordinance which was defeated at the last meeting of the Assembly and referred to the committee.

Salem, Mass.—The Salem & Wakefield Street Railway Co. has asked for a charter to build an electric road from the center of Salem through Peabody to South Lynnfield, and thence along the new Berryport turnpike to North Saugus, where it will connect with the Wakefield & Reading road.

Scranton, Pa.—Plans are being prepared for a large car barn on Providence Road It appears that the present plan is to abandon the Linden street barn and to place all the cars in the new building. It is also proposed to erect an office building at the same place, where most of the business will be done.

Waynesboro, Pa.—The Blue Ridge Electric Railway and Power Co. has been incorporated to build an electric road from Waynesboro to Buena Vista and other resorts on the Blue Ridge Mountains. Capital stock, $200,000.

Winchester, Mass.—Permission has been granted by the selectmen to change the location of the crossing of the North Woburn Electric Railroad over the Boston & Maine.

GENERAL RAILROAD NEWS.

Baltimore & Ohio.—The Union Trust Co., of New York, representing the holders of bonds of the Pittsburgh & Connellsville, a leased line of this road, filed a suit in the United States Court at Baltimore, Md., Sept. 15, asking for a foreclosure of the Pittsburgh & Connellsville and the appointment of a Receiver, pending the suit. These are second consolidated mortgage bonds of January, 1885, for $10,000,000, and it is stated that interest is in default since August last.

Chesapeake, Ohio & Southwestern.—A default of six months' interest having occurred in the payment of the coupons of the first mortgage bonds of this company, dated Jan. 28, 1882 ($6,176,000 outstanding), the Illinois Central Company, which holds the majority of the bonds, has exercised its option to declare the principal due and payable. Payment is to be made at the office of the Illinois Central, 214 Broadway, New York City. This transaction frees the property from all prior liens and leaves the Illinois Central free to issue the proposed Louisville division and terminal bonds upon it.

Cincinnati, New Orleans & Texas Pacific.—The earnings of this line of the Queen & Crescent for the year ended June 30 were reported as follows:

Year:	1897.	1896	Inc. or Dec.
Gross earn	$3,440,505	$3,685,864	D. $245,359
Oper. expen	2,343,180	2,645,872	D. 302,692
Net earn	$1,097,325	$1,039,992	I. $57,323

Erie.—The earnings for the fiscal year ended June 30, 1897, and for the seven months ended June 30, 1896, were reported to the New York State Railroad Commission as follows:

	Year 1897.	7 months 1896.
Gross earn	$29,751,010	$15,477,937
Oper. expen	20,281,353	11,030,959
Net earn	$8,769,657	$4 446,978
Other income	238,857	15,334
Total	$9,008,514	$4,460,312
Fixed charges	8 636,495	3,879,507
Surplus	$352,018	$58 ,805
Total surplus	503,728	....
Betterments	689,135	2,106,255

Georgia Southern & Florida.—The earnings of this line of the Southern for the year ended June 30 were reported as follows:

Year:	1897.	1893.	Inc. or Dec.
Gross earn	$863,511	$859 115	D. $5,574
Oper. expen	590,707	610,329	D. 19,622
Net earn	$272,834	$258,786	I. $14,048
Interest	179,875	179 200	I. 675
Surplus	$92,959	$79,586	I. $13,373

Illinois Central.—At the annual meeting of the stockholders of this company, held at Chicago, September 15, it was decided to accept the plan of refunding recently proposed in the official notice of that meeting. The plan provides for the issues of first mortgage 3½ per cent. gold bonds as follows: On the Springfield Division, $2,000,000, payable 1951; on the St. Louis Division and terminals, $10,000,000, payable 1951; on the Louisville Division and terminals, $20,000,000, payable 1951. The refunding plan is given in detail in this column for May 28.

Leavenworth, Kansas & Western.—This company has been incorporated in Kansas with a capital stock of $1,000,000 as the reorganization of the old Kansas Central which was sold at auction under foreclosure at Leavenworth, Kan., June 25 (see this column for July 2). The directors, who are said to represent Union Pacific interests, are named in another column.

New York Central & Hudson River.—The earnings for the quarter ended Sept. 30 (estimated for 1897) were as follows:

	1897.	1896.	Inc. or Dec.
Gross earn	$12,379,000	$11,269,899	I. $1,109,101
Oper. expen	8,036,000	7,596,768	I. 439,232
Net earn	$4,343,000	$3,673,131	I. $669,869
First charges	2,624,000	2,627,088	D. 3,088
Balance	$1,719,000	$1,046,043	I. $672,957
Dividend	1,000,000	1,000,000	.....
Surplus	$719,000	$46,043	I. $672,957

The percentage of operating expenses to gross receipts was 64.92 per cent. for 1897 against 64.41 per cent. for 1896.

New York, New Haven & Hartford.—The earnings for the fiscal year ended June 30 were reported as follows:

Year:	1897.	1896.	Inc. or Dec.
Gross earn	$29,623,331	$30,046,171	D. $422,840
Oper. expen	20,043,257	21,137,226	D. 1,093,969
Net earn	$9,580,074	$8,908,945	I. $671,129
Other income	614,072	1,155,144	D. 541,072
Total	$10,194,146	$10,064,089	I. $130,057
Fixed charges	6,315,903	6,397,199	D. 81,296
Balance	$3,878,243	$3,666,890	I. 211,353
Dividends	3,803,516	3,608,542	I. 194,974
Surplus	$74,727	$58,348	I. $16,379

Panama.—An issue of $2,000,000 first mortgage four per cent. sinking fund gold bonds due Oct. 1, 1917, has been offered in New York at 101 flat and is largely oversubscribed. These bonds will be used to retire the outstanding sterling bonds of $1,846,000 due Oct. 10, and for betterments. The new loan will constitute the only mortgage indebtedness of the company and is secured by the first lien on all the property.

Philadelphia & Reading.—Drexel & Co., of Philadelphia, announce that they are ready to purchase the improvement mortgage six per cent. bonds of this road due Oct. 1, 1897, with interest in full to that date. The loan, amounting to $9,364,000, will be extended for 50 years from April 1, 1897, at four per cent. interest.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The earnings for August and for the eight months ended Aug. 31 were reported as follows:

	1897.	1896.	Inc. or Dec.
August:			
Gross earn	$1,322,494	$1,199,935	I. $122,559
Oper. expen	813,818	769,019	I. 44,799
Net earn	$508,676	$430 916	I. $77,760
Charges	225,721	245,644	D. 19,923
Surplus	$282,955	$185,272	I. $97,683
Eight months:			
Gross earn	$9,349,727	$9,698 833	D. $349 106
Oper expen	6,623,345	7,218,151	D. 594,806
Net earn	$2,726,382	$2,480,682	I. $245,700
Charges	2,070,895	2,162,173	D. 91,278
	$655 487	$318,509	I. $336,978

Portland & Rumford Falls.—The earnings for the fiscal year ended June 30, according to the annual report just received, were as follows:

Year:	1897.	1896	Inc. or Dec.
Gross earn	$262,624	$211,906	I. $50,718
Oper. expen	153,178	125,068	I. 28,110
Net earn	$109.446	$86,838	I. $22,608
Charges	52,879	46,508	I. 6,371
Surplus	$56.567	$40,330	I. $16 237
Dividends	30,000	15,000	I. 15,000
Balance	$26,567	$25,330	I. $1,237

Including the undivided balance the divisible earnings for 1897 were 5.6 per cent. on the entire capital stock.

Toledo, St. Louis & Kansas City.—In the suit brought by the creditors and bondholders of this company for its sale to pay debts Judge Taft, of Toledo, O. Sept 17, decided that the company is a *de facto* corporation, and that creditors cannot dispute its bonds on that ground; that the Illinois State constitution had no application to the old reorganization and bonds are not invalid on that account; that creditors cannot be heard to impeach that which was a condition of the situation when they became creditors, and that there is nothing to show that bonds of the road were sold at less than 75 per cent. of their value. He directed that the question as to whether bonds were sold to directors at less than par should have a hearing, and that petitioners have leave to file a new petition attacking such bonds.

Union Pacific.—Judge Lacombe, of the U. S. Circuit Court, has appointed W. D. Cornish special master to report upon the accounts and evidence in connection with the suit of J. Pierpont Morgan and others against this company and its receivers. This is to facilitate compliance with a recent order of the Court directing the trustees to sell from time to time any of the bonds, stocks and securities held by them to procure funds with which to redeem outstanding collateral notes issued in 1891.

The trustees under the Union Pacific collateral trust agreement of 1891, securing the gold six per cent. notes, have sold to a syndicate all the consols of 1890 and all the capital stock (13,250,352) of the Union Pacific, Denver & Gulf, which on Jan. 1, 1897, were among the collaterals held for the above gold notes. In this sale the Colorado Central seven per cents. for $4,437,000 and underlying lien on the Union Pacific, Denver & Gulf were not included. The syndicate is represented by Hallgarten & Co., who state that the amount of consols required is 6,537,000.

Union Pacific, Denver & Gulf.—The Reorganization Committee, of which Grenville N. Dodge, New York, is Chairman, agreed upon a plan of reorganization Sept. 18, and holders of all classes of securities of the company are called upon to deposit them immediately with the Central Trust Co., of New York, or the American Loan & Trust Co., of Boston. Certificates of deposit will be issued which will be listed upon the New York Stock Exchange as soon as practicable if permission is granted.

York Harbor & Beach.—The earnings of this branch of the Boston & Maine for the fiscal year ended June 30, according to the annual report just received, were as follows:

Year:	1897.	1896.	Inc. or Dec.
Gross earn	$37,546	$38,089	D. $543
Oper. expen	25,689	23,736	I. 1,953
Net earn	$11,857	$14,353	D. $2,495

A dividend of four per cent., amounting to $12,000, was paid to stockholders Jan. 1, 1897.

Electric Railroad News.

Birmingham, Ala.—A Birmingham paper states that the Birmingham, Powderly & Bessemer dummy line has been sold to the Birmingham Railway & Electric Co. The sale includes a large tract of land near Cleveland. It has not been decided what will be done with the road regarding reconstruction, etc. Not long ago the B. P. & B. road voted to spend $40,000 on improvements.

Hagerstown, Md.—President C. W. Lynch, of the Hagerstown Electric Railway Co., states that all the company's bonds have been sold.

New York.—On Sept. 14 the Metropolitan Traction Co. was merged into the Metropolitan Street Railway Co. Each stockholder of the former company received in lieu of his traction stock an equal amount of street railroad stock and 20 per cent in 5 per cent certificates or bonds. By this merging the shareholders will not be required to pay a double taxation.

Philadelphia.—The second annual meeting of the stockholders of the Union Traction Co. was held on Wednesday of last week. Mr. John B. Parsons, Vice-President and General Manager, was elected to the Board of Directors, and Mr. A. J. Cassatt, who was elected to fill the vacancy of Mr. C. F. Fox, resigned his place on the Board of Directors. The report of nine months' operation shows a deficit of $851,934, which is a decrease of about $350,000 from the deficit of the corresponding nine months of the previous year.

Pittsburgh, Pa.—An option has been given by the directors of the Pittsburgh, Knoxville, Fair Haven & Mt. Lebanon Traction Co. on its entire franchises to the proposed new Pittsburgh & Mansfield Traction Co. The option is granted until April 4, 1898, and it is expected the absolute transfer of the property will be made before that time.

St. Louis, Mo.—The Hauseman Air Line has been consolidated with the St. Louis & Meramec River Railroad, and cars of the latter road are now running through to the Highlands, a distance of about 15 miles from the center of the city. These lines were shown in a map in the *Railroad Gazette* of June 18 last.

Syracuse, N. Y.—A special meeting of the stockholders of the Syracuse & East Side Railroad Co. will be held Oct. 1 for the purpose of voting on a proposition to increase the capital stock from $250,000 to $375,000. The additional amount will be preferred stock. Plans have already been prepared for building the new East Side road and improving some of the present lines, costing in all about $125,000.

TRAFFIC.

Traffic Notes.

The Terminal Car Service Association of St. Paul has established a branch office at Fargo, N. Dak.

A reduction in rates on packing house products is announced from Kansas City to Texas points, to take effect Sept. 24. The reduction is from 65 cents per 100 lbs. to 58.

In South Carolina the Southern Railway and the Atlantic Coast Line have posted notices announcing that they will not hereafter receive for shipment into that state unboxed liquor packed in chaff or sawdust in cars. It is only by such shipments that the "original package" dealers can sell with profit, as otherwise bottles must be packed and shipped separately or in case, and cases cannot be broken. The notice of the Coast Line says: "Inasmuch as our legal department advises that the release adopted for shipments of liquor in bottles, packed in separate cases, will not be of legal effect to protect us against loss in case of wreckage caused by our own negligence, and as property is not in shipping condition without a legally effective release, we give notice that from and after Sept. 15 we will not receive shipments of liquor so packed."

Commission Rates in South Dakota.

Early this month Judge Carland, of the Federal Court, sitting at Sioux Falls, S. Dak., issued a temporary injunction restraining the State Railroad Commissioners from putting into effect their proposed reduced schedule of rates. A hearing on the question of a permanent injunction is to be had at once.

The Present Status of "Section 22."

The Attorney-General of the United States has given an opinion regarding the force of Section 22 of the new Tariff act. His conclusion is, in effect, that this section does not impose a discriminating duty upon merchandise from China, shipped through Canada in bond into the United States; also that it does not impose a discriminating duty upon merchandise from Chili brought to United States ports in an English vessel. This really takes all the force out of the section, leaving nothing but the threat of retaliation in case of discriminations against our ships, which threat is nothing new under our laws.

Winter Tours.

Many of the railroads are looking for a big winter tourist business. The Pennsylvania has made an arrangement for California tours, which will be inaugurated Oct. 2. Through tourists cars will run from Philadelphia to Chicago, thence over to the Milwaukee & St. Paul to Omaha; thence over the Rock Island to Colorado Springs and then by the Colorado Midland, the Rio Grande Western and the Southern Pacific.

The Santa Fe will resume its California limited service Oct. 15, running twice a week until Jan. 1, when trips will be established three times a week. The running time from Chicago to Los Angeles will be 72 hours.

Chicago Traffic Matters.

CHICAGO, Sept 22, 1897.

Western presidents of the big systems have decided to fight any attempt made by the Chicago & Indiana State Line Railway Company to raise terminal charges at the Union Stock Yards, and with that idea in view met last week and confirmed the settlement governing charges on live stock, which has been in effect since 1894.

The new Chicago rate sheet which fixes passenger fares in the central passenger territory, which went into effect last week, withdraws all unlimited rates and tickets are now sold only with a one-day limit.

An agreement has been reached between the Chicago-St. Paul lines and the roads running into the Dakotas and Montana to charge for sheep by the hundred pound weight instead of by the carload, as has been the practice for years.

The Wisconsin Central on Monday cut the hard coal rate from Manitowoc to St. Paul and Minneapolis, putting in a rate of $1.25 on hard and 75 cents on soft coal, in order to meet the low rates applying from Duluth. The same road also announces a class tariff of 20 1st, 20 2d, 20 3d, 10 4th, 10 5th and 10 6th from Buffalo lake and rail via Manitowoc to St. Paul.

On Sept. 25, the Alton road announces, it will reduce the glucose rate to Kansas City from Chicago to 18 cents, Peoria 15½ cents and East St. Louis 13 cents, a cut of 2 cents per hundred pounds.

The Burlington has established a new through tourist and chair car line between Denver and Portland.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the Western termini of the trunk lines for the week ending Sept. 16 amounted to 65,222 tons, as compared with 63,221 tons the preceding week. This statement includes 31,044 tons of grain, 2,611 tons of flour and 10,728 tons of provisions, but not live stock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Sept. 16.		Week Ending Sept. 9.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	2,718	4 2	3,897	6.2
C., C., C. & St. Louis	3,481	5 3	2,480	3.9
Erie	8,987	13.8	10,539	16.7
Grand Trunk	9,298	14 2	7,090	11.2
L. S. & M. S.	6,470	9 9	3,287	5.2
Michigan Central	7,899	12 1	13,696	21.7
N. Y., Chi. & St. L.	5,668	8.7	4,076	6.4
Pitts., Cin., Chi. & St. Louis.	3,366	5.2	4,044	6 4
Pitts., Ft. Wayne & Chicago	9,531	14.6	8,625	13.6
Wabash	7,804	12.0	5,487	8.7
Totals	65,222	100.0	63,221	100.0

Lake shipments last week were 135,916 tons.